
MASSACHUSETTS
INSTITUTE of TECHNOLOGY

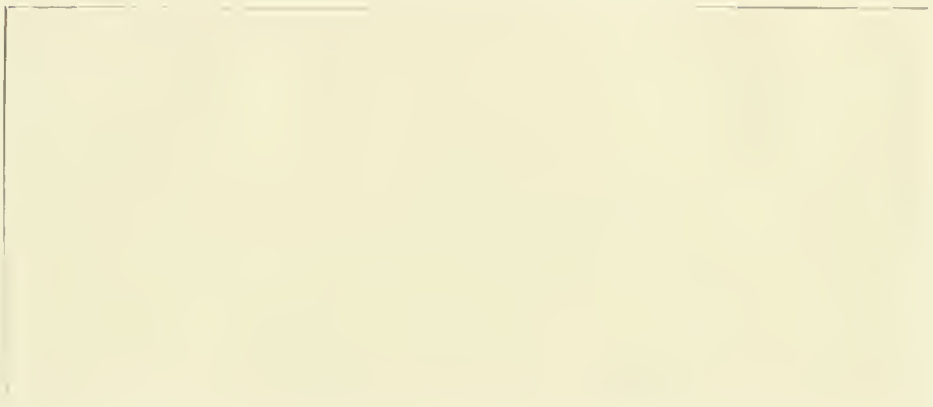
WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

HOME INSURANCE IN A CHANGING RESIDENTIAL COMMUNITY: A SYSTEM DYNAMICS APPROACH AND CASE STUDY

Jack B. Homer

WP 1108-80 December 1979

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY
50 MEMORIAL DRIVE
CAMBRIDGE, MASSACHUSETTS 02139



HOME INSURANCE IN A CHANGING RESIDENTIAL COMMUNITY: A SYSTEM DYNAMICS APPROACH AND CASE STUDY

Jack B. Homer

WP 1108-80 December 1979

System Dynamics Group
Alfred P. Sloan School of Management
Massachusetts Institute of Technology
Cambridge, Massachusetts

CONTENTS

SUMMARY

This report examines transition in inner suburban communities and how insurance companies should regard the sometimes rapid changes that occur in these areas. In order to understand how the physical, economic, and social aspects of a community work together to create a self-sustaining transition that produces losses for the insurer of homes, a system dynamics computer simulation model of home insurance coverage in a residential community was constructed.

The model, called INSUR2, contains four major sectors: population, housing, quality of neighborhood life, and insurance. There are three levels of population -- upper, middle, and lower class. These levels are affected by rates of birth and death and in-migration and out-migration which are generated within the model. There are six types of housing which differ according to market values and replacement costs. Housing construction, demolition, obsolescence, and renovation are endogenously generated and affect these housing stocks. The quality of neighborhood life is a central concept to this study and differentiates it from other models which consider almost exclusively the physical or economic bases of change. Quality of neighborhood life reflects community services as well as the social stability of the local neighborhood. The insurance sector keeps track of policies which are written and then may be cancelled or non-renewed. Mainly on the basis of neighborhood conditions and past performance in the area, the company decides to what extent it will make insurance available in the community. Profits in the community are com-

puted from premiums earned minus expenses. Insurable property damages include property crimes and some wear and tear. Property crimes are divided into the two categories of arson and "miscellaneous" property crimes. Housing conditions in the simulated community are determined by looking at the accumulation of unrepaired damages.

The model was parameterized to represent the city of Melrose, Massachusetts, which is located about seven miles north of Boston and is a typical inner suburb which has undergone considerable changes in population and housing since the 1940s. Simulation of the Melrose-adapted model produces a history starting in 1900 which closely matches available data and descriptive material. It portrays a future for Melrose through the year 2020 in which the decline of the last forty years may become sustained and therefore cause some worries among insurers.

The INSUR2 model was analyzed in terms of its feedback structure to discover why the decline occurs and what can be done about it. The two major results concerning the mechanism of decline are:

(1) The transition is triggered by decreasing availability of choice parcels of land, which leads to decreased housing construction and increased conversions to multi-family, renter-occupied, lower-class dwellings;

(2) In the case of an originally well-to-do community like Melrose, the downward transition--which implies a decline in company profit

margin--is only sustained (into ultimate decay and abandonment) if the changing population mix leads to inter-class tensions and defensiveness which break down neighborhood cohesiveness.

Neighborhood cohesiveness is thus identified as the key indicator of a community's health and its ability to maintain the stability required to support good home maintenance and protection against various damages. Neighborhood cohesiveness is defined as the presence of good neighborly relations and the common feeling that the neighborhood is relatively free of divisiveness.

A number of simulations consider alternative futures for Melrose and similar communities. The results are:

- The "return-to-the-city movement" which has led to gentrification in some inner cities will not benefit Melrose significantly and may even prove marginally detrimental to company profits in the short run.
- A complete cutoff of insurance availability accelerates the transition by reducing the fraction of homes that are owner-occupied.
- If, instead of the partial insurance availability withdrawal of the base run (about 50% by the year 2020), insurance is made fully available, the effect on the community is negligible and the effect on profits is somewhat negative after 1990.
- The housing programs which are most effective in slowing down and eventually reversing neighborhood decline still produce little noticeable improvement over the base run until 1990, after which

they push the community back up to its past (1960) mix of population and housing primarily by displacing lower-class residents from the community.

- Programs aimed at improving neighborhood services and facilities can improve community satisfaction and pride, but may not have lasting effects, because they do not directly improve social cohesiveness. However, they are worth advocating as part of a comprehensive revitalization program, and they directly increase company profits by increasing local commitment. The positive image-building value of historic preservation is noted.
- The promotion of strong community organizations is identified as an effective way of stabilizing the neighborhoods and increasing the quality of life (and therefore, company profits). Short-term investments in developing capable organizations can pay off in the long term, because such groups attract citizen participation and help create a more cohesive and committed community.

In the Conclusions, it is recognized that an insurance company is not generally in the position to coordinate or implement the beneficial programs mentioned above. As one participant in the community, however, it can influence what happens and persuade the city government and other important participants to take the kinds of actions which will make company withdrawal unnecessary.

To the memory of Gil Low, a dear friend, advisor, and teacher

1. INTRODUCTION

1.1 The Problem

There are many communities in the United States that have experienced profound changes during the last few decades. Metropolitan residential patterns are now changing more quickly than ever, for a variety of reasons, among them the steady saturation of both urban and suburban land areas, the increasingly significant needs and preferences of the baby boom generation, the high and rising costs of new housing and private transportation, and the generally fluid nature of American society.

Insurance companies, as well as banks and other financial institutions, have a special interest in the destinies of communities. They provide important services for their customers and hope to make a profit in return. In this way, communities are considered markets for investment by such institutions. When the risk and uncertainty associated with an investment is high, the potential investor may have second thoughts about entering the market and the present investor may wish to pull out of it. The deterioration of many inner city areas and the resulting losses to some insurance companies and banks have sensitized both industries to the dangers associated with rapidly changing residential areas.

A number of suburban areas, especially those located closest to the city, have been in the midst of the changes in this country mentioned above. An investor's natural reaction is to regard these changes with suspicion. Some observers believe the inner suburbs will follow the same path of deterioration as the inner cities. This statement often reflects

the notion that all so-called "transitional" neighborhoods go through a fixed sequence of five or six well-defined stages of deterioration that begins with a decline in socioeconomic status and ends with decay and abandonment.[1] Since many of the inner suburbs have aging housing stocks and are being increasingly "invaded" by residents of lower social status, insurance companies and banks may be tempted to get out before such communities "tip" and become unprofitable.

This paper will focus on the involvement of insurance companies in transitional inner suburban areas. The first consideration will be whether the hesitancy about these areas is at all justified. After all, "neighborhoods in fact change all the time, and.....while they might decline, they also possess the power to regenerate themselves."[2] It is likely that the worries are justified in some cases and not in others. Therefore, insurance companies should have an appreciation for the leading indicators or preconditions which point to an extended period of losses with no ultimate recovery of profits.

The second consideration will be what an insurance company should do if it determines that a given neighborhood is a bad risk. If the company does not presently insure homes in the area, the answer is probably to stay out; that is the company's prerogative, as long as it can be demonstrated that the decision to stay out is not based on the kinds of discrimination (such as racial discrimination) that have been shown to violate the Fair Housing Act.[3] However, if the company is already active in the community, its range of realistic alternatives may be narrowed by public interest considerations.

When an insurance company agrees to insure homes in a community, it enters into a tacit agreement to act with the community's welfare in mind. In cases of policyholder fraud or arson or other breach of contract, it is in both the company's interest and in the community's greater interest to cancel individual insurance policies. But to simply withdraw from a community because of the fear of future losses is socially irresponsible if the withdrawal condemns the community to severe deterioration it need not otherwise have faced. The company should therefore make an effort to work together with various public and private agencies and individuals both inside and outside the community to make a disruptive and damaging exit unnecessary. Aside from the obvious virtues of such actions, the long-run results might well include a financial return to the insurance company that makes the effort worthwhile. This study will explore the relative merits of the various actions that might be taken in an attempt to stabilize or revitalize a transitional community.

1.2 The Approach

The uncertainties of insurance companies concerning transitional inner suburbs and how they should be treated cannot be transformed into certainties by any methodology or analytic approach. The purpose of this paper is rather to enhance understanding of the problem and pave the way for informed decision-making. Even though different communities call for different types and degrees of institutional response, the major tenet here is that these differences can all be understood within one theoretical framework. The basis for this framework should be the essential elements

found in every community, such as a population, a housing stock, and community services. The important decisions and forces that affect these elements and that are affected by them should also be represented; for example, the decision to move out of the community or the decision to renovate a house. By examining a simplified but still realistic model of a typical community, one hopes to draw certain conclusions about why the regularities and similarities present in a wide variety of settings exist and which policy levers may be the most useful in generating beneficial change.[4]

This paper discusses a generic system dynamics model of a residential community and its interactions with an insurance company (or group of insurance companies) and with the rest of its "limitless environment".[5] The premise in using such a model is that a detailed analysis of the decision-making structure of a system is more fruitful in understanding its behavior than any analogical model, such as the biological model of urban decline which "assumes that neighborhoods go through an irreversible cycle of growth, maturity, decline, and death which varies only in duration and intensity".[6] Such analogical models neither demonstrate why the observed behavior follows from the underlying structure nor do they suggest how policymakers should act.

System dynamics emphasizes the importance of feedback in all decision-making processes. For example, building contractors will generally respond to excess housing demand as reflected in market values by building new dwellings. Other things staying the same, construction of homes will decrease the excess demand for them and, in turn, decrease housing construction. The situation can be illustrated in the "causal-loop" format shown in Figure 1. Each arrow in the loop shows the direction

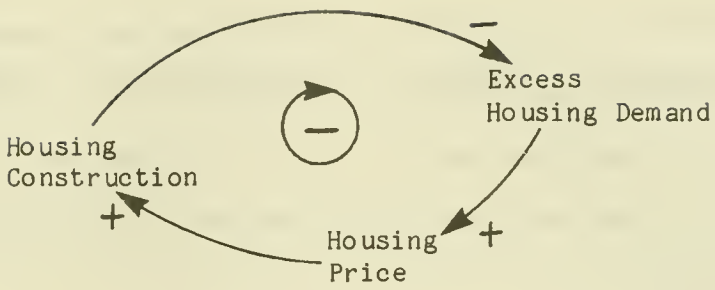


Figure 1: A feedback loop involving housing construction, excess demand, and price.

of causation and the plus or minus sign at the arrowhead indicates the direction of effect for a given causal link. Thus, the positive link between excess housing demand and housing price says that if the former increases, so will the latter (other things still being equal). The loop symbol in the middle of the diagram indicates the overall polarity of the loop, in this case negative. A negative loop can be thought of as a controlling or correcting loop, in that pressures (such as excess housing demand) elicit a response within the loop (housing construction) which tends to diminish those pressures. A positive loop, on the other hand, can be responsible for runaway growth or collapse; a standard example of positive loop behavior is exponential population growth, which can be traced back to the fact that more people means more babies means more people and so on.[7]

The computer simulation model used in this study is called INSUR2. Such a model is necessary to draw the correct behavioral conclusions from an assumed set of structural relationships as complex as those being considered here. INSUR2 can be parameterized to represent a wide diversity of communities and insurance companies. To study the specific problem of

inner suburban decline, a case study approach has been taken. The city of Melrose, Massachusetts, was chosen as a community which is typical of the kind of suburban areas under consideration. The conclusions that are reached relative to Melrose should apply to other transitional residential communities as well.

Various kinds of available information on Melrose and its surroundings and on the property insurance business were used to develop and parameterize the model and help establish the reasonableness of its output. This data came from a variety of sources, both published and personally communicated. The Corporate Research and Personal Lines divisions of Commercial Union and the Planning Office of Melrose were especially helpful in making this project possible.

2. INSUR2: A MODEL OF HOME INSURANCE IN A RESIDENTIAL COMMUNITY

2.1 An Introduction to the Model

Scope and Boundary

The INSUR2 model can be used to examine the internal dynamics of a residential community and how they affect and are affected by insurance companies that offer homeowner's coverage.*

A residential or "bedroom" community has relatively few commercial or industrial structures, and most of its working residents are employed outside the community. The community has a fixed geographical boundary beyond which it cannot expand. People arrive to and depart from the community across this boundary; and although their internal movements are not computed in the model, the broader concept of residential stability is made explicit.

The population in INSUR2 is subdivided according to social class but not age, sex, religion, or race. The housing stock is subdivided according to market value and replacement cost and is subject to damage and repair. The community contains an unspecified number of sub-neighborhoods which have common access to community services. Services and stability are the two factors in the model which directly determine the community's quality of life.

---

* System Dynamics Group Memorandum D-3180 includes a Technical Appendix with complete model documentation.

In reality, a community is often affected by events determined outside of its borders, including broad economic and demographic changes and more localized events, like the construction of new transportation lanes. These events are considered "exogenous" or beyond the scope of the model, but they can be assessed in a general way by looking at their primary effects on population and housing flows. (In this way, the "return-to-the-city movement" is examined in Section 5.)

The insurance company has a limited but realistic role in the model. It can determine homeowner's insurance availability in a given community; in real life, this is done by hiring, firing, or reallocating insurance agents and by setting standards that control the type of business that is accepted. The setting of premiums is beyond the scope of the model, however, since insurance rates are not determined on a community-by-community basis.

Overview

Figure 2 provides a pictorial overview of the INSUR2 model. The community develops within a fixed land area and consists of three interconnected sectors: population, housing, and quality of neighborhood life. The community is linked to a fourth sector, the insurance sector.

The land area is used in computing the population density and the fraction of land still available for residential development. In addition, zoning restrictions arise from the need to parcel out the limited land for various uses. The population density affects the quality of neighborhood life, because the distance between people and the proximity of group

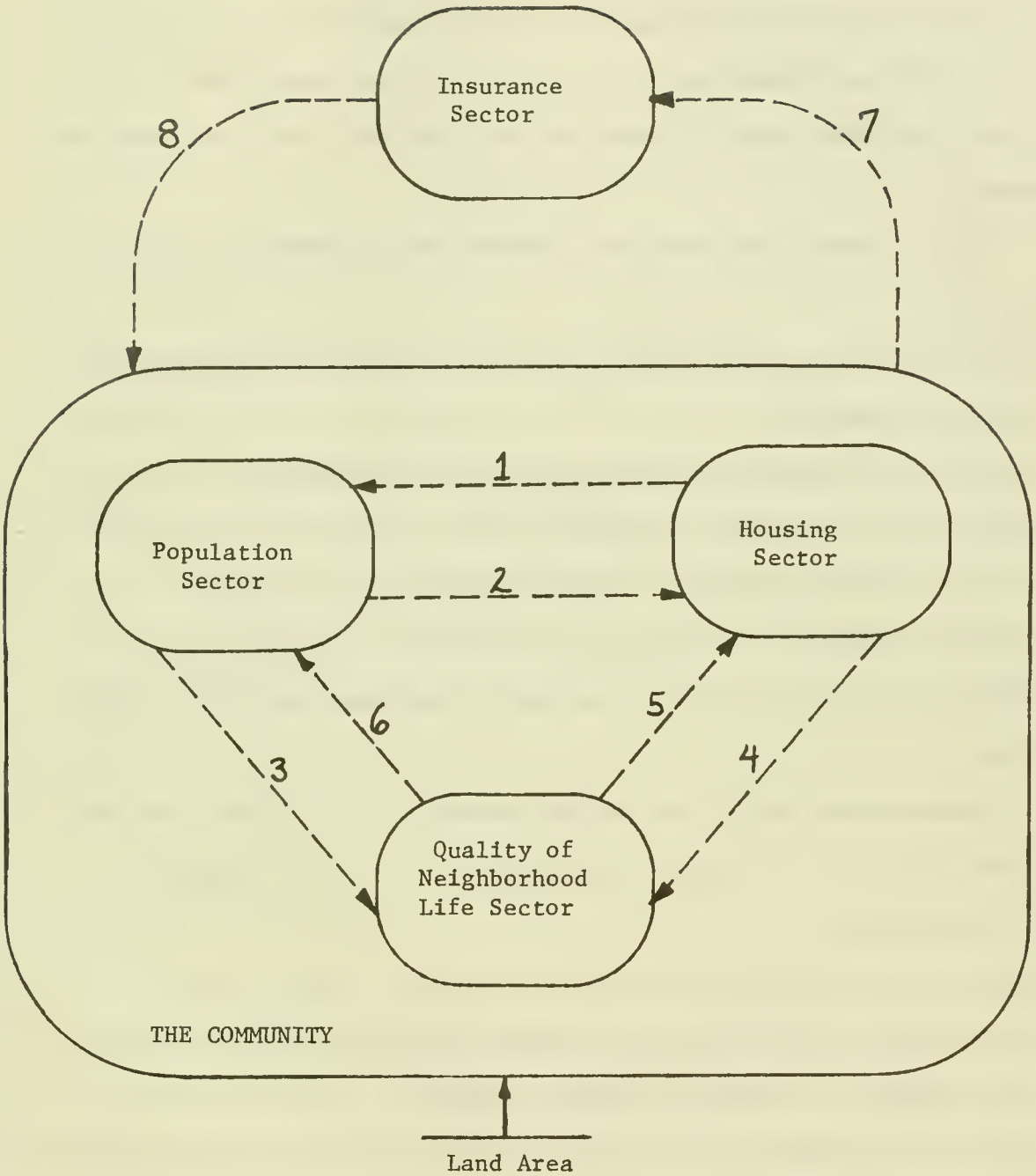


Figure 2: An Overview of INSUR2

territories can affect neighborliness and crime.[8] Land availability and zoning can have critical effects on housing activities. As the area becomes fully developed, choice parcels of land become relatively scarce and the cost of land rises relative to property values; under such conditions, new construction is inhibited and demolition and renovation are encouraged.[9]

The following is a brief description of the numbered linkages in Figure 2:

(1) The availability and price of housing affect population in-migration and out-migration;

(2) The size and composition of the population affect housing construction, demolition, obsolescence, and renovation;

(3) The quality of neighborhood life (an aggregate measure of the vitality, robustness, or strength of the community's sub-neighborhoods) is affected by population mix, population density, and crime;

(4) Quality of neighborhood life is also affected by the adequacy of the housing stock, its condition, and the fraction of homes which are owner-occupied;

(5) The quality of neighborhood life is an important factor in the determination of both property damage (including property crime) and repair as well as new housing construction;

(6) Quality of neighborhood life also affects people's decisions to enter or leave the community;

(7) Insurance companies are affected both directly and indirectly by all three community sectors. Property damage affects profits in an obvious way. When making decisions that affect the writing of new policies and the non-renewal or cancellation of existing policies, insurance companies look not only to past experience with the community, but also to such indicators of future risk as the condition and cost of housing and the quality of neighborhood life;

(8) The availability of property insurance affects the entire community. People who desire insurance coverage to limit their liability or need insurance to obtain a mortgage are deterred from entering if they cannot get it. Arson-for-profit is possible only when a building is insured; and when it is perceived that cancellations and non-renewals are on the increase, property speculators are often tempted to burn their buildings quickly and get out before the local housing market slumps. Finally, the lack of home insurance will tend to magnify the residents' feelings of insecurity or fear due to property crime, since they will have to pay for needed repairs out of their own pockets.

2.2 The Population Sector

Figure 3 shows the basic structure of the population sector, using conventional system dynamics symbols to represent levels and rates.* There are three levels of population: upper class, middle class, and lower

---

* A level (▭) represents an accumulation or integration of rates (⋈→). In mathematical notation:

$$\text{LEVEL} = \int [\text{RATES IN} - \text{RATES OUT}]\, dt$$

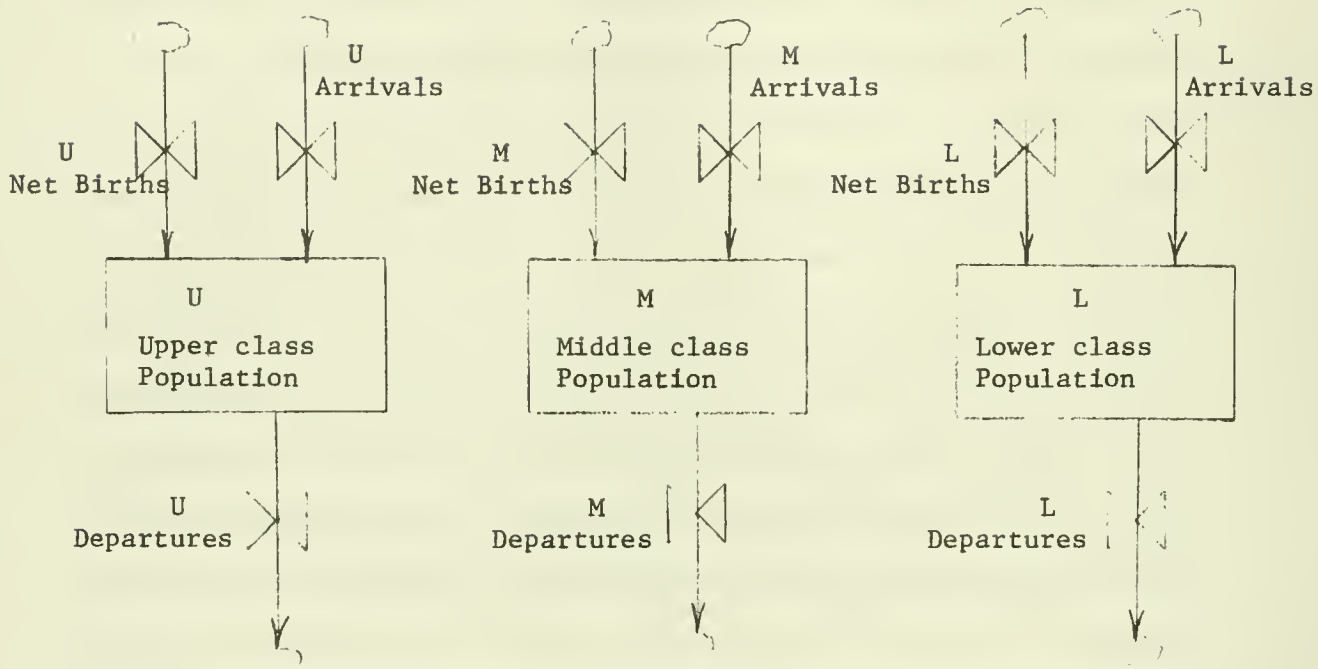


Figure 3: Population Sector

class. Each population level is changed by a net birth rate, an arrival (in-migration) rate, and a departure (out-migration) rate. It is assumed for the sake of simplicity that present inhabitants cannot move from one class to another.

The model identifies these separate classes of people for several reasons. First, well-to-do people can afford to purchase and maintain premium single-family dwellings, whereas lower class people tend to be renters and live in old or inexpensive multi-family dwellings. Second, income is closely related to the quality, quantity, and specific kinds of services provided in the community. Third, social class is connected with the kind of neighboring that is observed: "Greater economic well-being decreases the need for mutual aid and increases the use of critical, selective faculties...In the words of one writer, 'the higher the level of prosperity, the higher the fences.'"[10] Fourth, different socioeconomic classes are generally associated with different levels of education, types of families, and sets or ranges of skills, material possessions, interests, and values. These attributes are important to the extent that they create relatively self-contained subgroups within the community which may view each other with suspicion and uncertainty. This is most noticeable when the different classes correspond to different races or ethnicities, which is commonly the case in American cities.

Within the population sector, the social mix is an important factor in the decision to move into or out of a community. More broadly, "[The characteristics of other residents] may determine how people will react to the adequacy of their houses and facilities, whether they intend to stay or move away, and how they cope with noise, overcrowding, and other inconveniences."[11]

2.3 The Housing Sector

Figure 4 shows the basic configuration of the housing sector. There are six levels of housing: upper housing, middle housing type 0 and type 1, and lower housing types 0,1, and 2. The two types of middle housing and the three types of lower housing differ as to their origins, and thus, their replacement costs. As the diagram indicates, a type 0 lower house was built originally as a lower house; a type 1 lower house was built originally as a middle house; a type 2 lower house was built originally as an upper house. The processes of construction, obsolescence (or down-conversion), renovation, and demolition are all represented as rates leading into or out of the levels. The model allows for special housing programs that can affect the rates of lower housing construction, demolition, or renovation. Also included are repair programs that can affect lower and middle housing conditions. The three broad classes of housing--upper, middle, and lower--are identified by their market values and their respective frequencies of use as owner-occupied versus rented units. By definition, upper class people live in upper housing, middle class in middle housing, and lower class in lower housing.

Market values and replacement costs are important to the housing market speculator who is a potential arsonist, and therefore, to the insurance company. This is becuase homes are usually insured on a replacement cost basis, which is felt to be representative of the true cost of repairs; for example, the insured value of a typical home in Massachusetts is 70-75% of its replacement cost.[12] When the ratio of market value to insured value (or the "housing value ratio", as it is

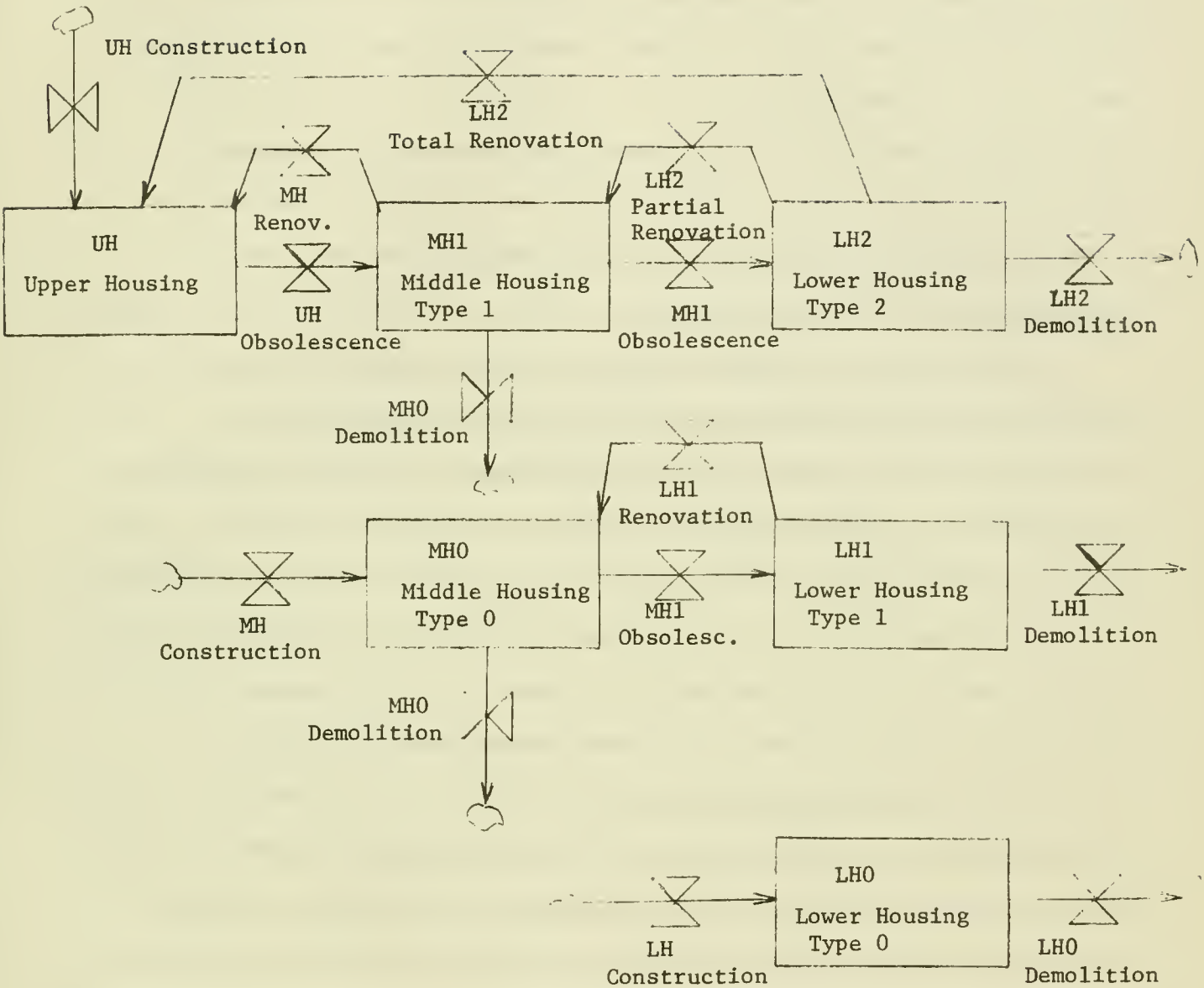


Figure 4: Housing Sector

called in the model) is less than one, a situation of "moral hazard" is said to exist, because there is economic incentive to burn the house rather than sell it.[13] Older dwellings are most likely to have low housing value ratios, because they were originally built with high quality materials (such as the marble in fancy old fireplaces) and workmanship that are hard to replace today, but they have deteriorated over the years and can no longer command the price they once did.

The community's housing conditions directly affect the rates of housing obsolescence and demolition and the perceived desirability of living in the area. Housing conditions are determined by past damages that went unrepaired. These damages may arise from wear and tear or from certain property crimes. Wear and tear occurs naturally with the aging of any structure and the use of its facilities, but can also be caused by the insurable "perils" of fire and lightning, water, ice, and snow, and windstorm.[14] Property crimes include breaking and entering, theft, vandalism and "malicious mischief", and arson.[15] Arson-for-profit is explicitly modeled in INSUR2 because of its special dependence upon insurance and the state of the housing market; the other types of property crime are initiated by people other than the owner of the dwelling and are grouped together under the title of "miscellaneous property crimes".

Both classes of property crime increase with housing abandonment. Miscellaneous crimes also increase with the fraction of lower class residents in a neighborhood, for economic and cultural reasons. With regard to housing repairs, lower class areas are often renter-dominated and short of savings; both factors tend to decrease the frequency and extent of repairs.

Repairs are also less likely when housing occupancy is low or when the housing stock is already in good condition.[16]

2.4 The Quality of Neighborhood Life Sector

Figure 5 shows the main elements and influences in the quality of neighborhood life sector. It is generally acknowledged that the intangible "social climate" of a community has an important influence on its development.[17] The determinants of this sense of community vitality cross lines of social class, ethnicity, and background: "The same attributes seem to matter to people of all sorts; the sources of dissatisfaction for one type of person are likely to be sources of discontent for everyone."[18] The quality of neighborhood life sector makes explicit the assumptions made in this study concerning how the social fabric is woven.

The quality of neighborhood life is determined by the levels of neighborhood services per capita and residential stability.* Services and facilities are made available to the entire community by both public and private organizations and individuals and include garbage collection, police and fire protection, public transportation, streets and street lighting, stores and shopping centers, schools, child day care, medical services, religious activities, and recreational activities in parks, playgrounds, swimming pools, museums, theaters, and concert halls. The quality, availability, and convenience of these services have a significant influence on the community's social climate.[19]

---

* Quality of neighborhood life is neither a level nor a rate. It is called an auxiliary variable and indicated by a circle in the flow diagram.

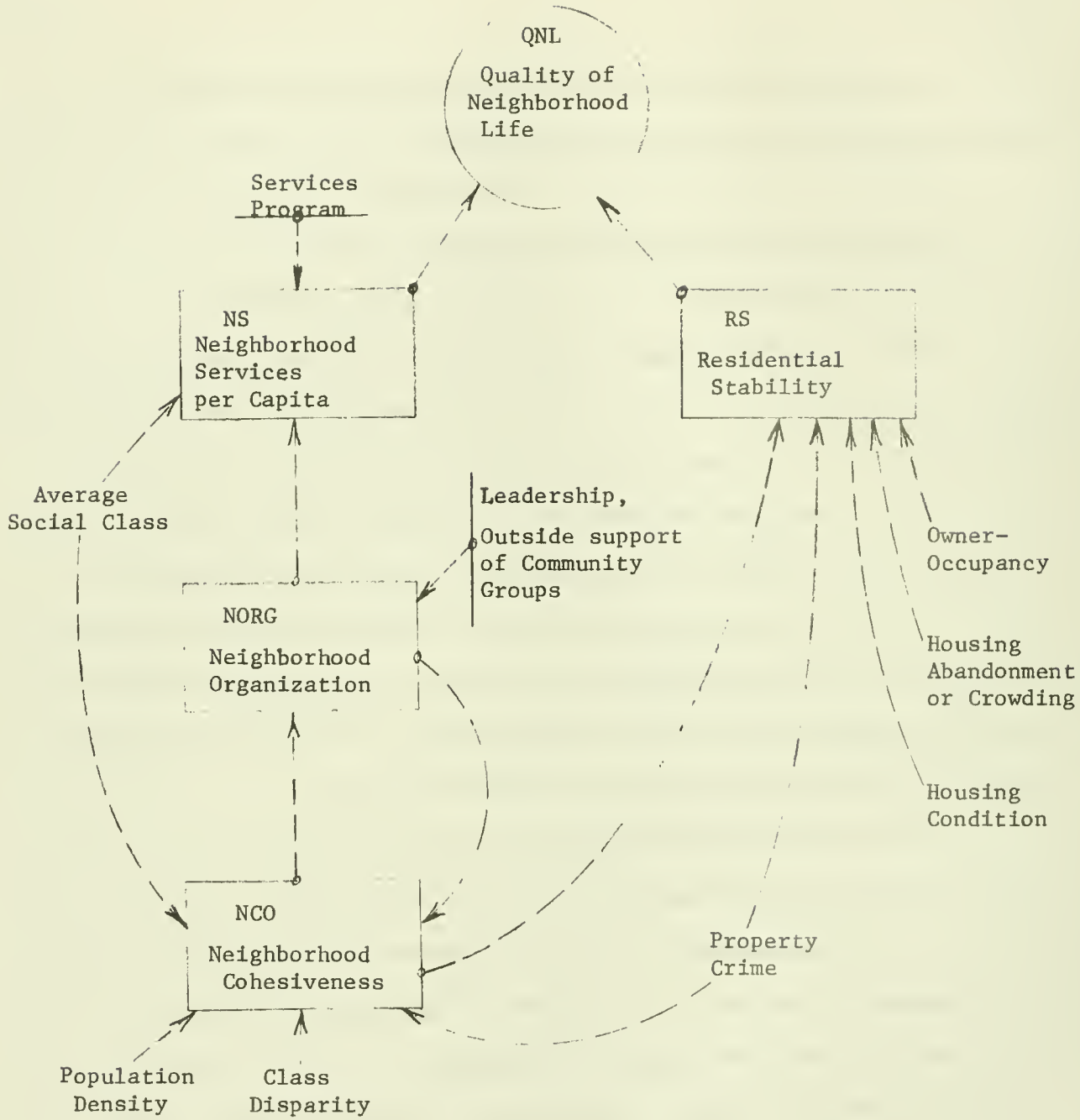


Figure 5: Quality of Neighborhood Life Sector

Neighborhood services depend upon average social class, neighborhood organization, and government-funded service programs. Although "persons in low income neighborhoods are more likely to require shops and services close to their homes,"[20] it is the poor communities which are least able to afford a wide choice of desirable services. Even in a poor community, however, neighborhood organizations can be effective in providing a variety of services and programs, such as "neighborhood newspapers, recreation centers, health centers, and the like", especially when the efforts of several smaller organizations are united on a community-wide basis.[21]

The impetus given by an internal core of leadership or by outside agencies or foundations will be most effective in fomenting group action if there is already a strong feeling of single-mindedness or cohesiveness within the community. Neighborhood cohesiveness is closely related to the amount of socializing or neighboring that goes on. One of the essential elements of good neighboring is people's willingness to help each other out in times of need;[22] for instance, a rash of vandalism can call forth neighborhood vigilantism and patrolling of the streets. The willingness to help in such situations is surely colored by such factors as population density and the natural neighborliness of the social classes involved.[23] However, the most important element of social unity appears to be people's perceptions that their neighbors are socially and culturally acceptable and that they have similar interests and needs.[24] Furthermore, "Interracial, ethnic, and class boundaries are often....volatile and likely to be hedged in by territorial segregation or elaborate signs for insuring avoidance

relationships."[25] This sort of defensiveness can severely crimp efforts to organize the community.

Admittedly, the social differences inherent in a high level of class disparity or heterogeneity "need not work against friendly or neighborly interactions provided that the potential partners are personally compatible".[26] However, the beneficial effects of compatibility are only relevant when the barriers to interaction have already been broken down somewhat. This may actually be the most important function of community organizations, "which may help to rebuild the community ties which traditionally existed in ethnic communities through strong religious and family organization."[27] In short, "Community organizing activities will bring more people together and this will help to strengthen the social fabric [read cohesiveness] of the neighborhood."[28]

The "micro-attributes" associated with smaller neighborhoods within the community (and even single blocks or groups of houses) seem to be more important than services (the "macro-attributes") in determining residential satisfaction.[29] These micro-attributes are the main determinants of a sense of community, a sense of security, and a sense of belonging. "This sense of belonging rests....on continuity and stability, the special virtues of the village."[30] It is important to note that residential stability, as the term is used here, cannot necessarily be inferred from the amount of in-migration and out-migration or from the frequency of movements within the community. Indeed, many neighborhoods maintain a strong sense of identity "despite continuous shifts in ethnic composition".[31] Residential stability must be ascertained, rather, by asking the residents directly if they feel secure and at home in their neighborhood.

Residential stability is affected by several factors: owner-occupancy of dwellings, the degree of abandonment or crowding of dwellings, housing conditions, property crime, and social cohesiveness. Past studies indicate that each of these factors can affect the residents' sense of security and their satisfaction with and commitment to the neighborhood.[32]

2.5 The Insurance Sector

Figure 6 is a simplified view of the insurance sector. The number of insurance policies in the community is a single level which is increased by new policies being written and decreased by existing policies being cancelled or non-renewed. Insurance availability affects policy-writing and non-renewal. When a case of arson-for-profit is discovered, the corresponding policy is cancelled. Less obviously, when profits in the community are perceived to be unusually low, insurance claims will be investigated quite carefully and more than the usual fraction of policies will be cancelled and non-renewed.

Normal underwriting practice suggests that insurance availability (or the ease of obtaining insurance) is a function of three levels: company evaluation of neighborhood condition, coverage ratio average, and profit margin average.[33] The company evaluation of the neighborhood takes into account the neighborhood housing value ratio (the degree of "moral hazard" in the community), the condition of the housing stock, and the quality of neighborhood life. The coverage ratio average is a measure of the company's familiarity with an area. When there is little familiarity with a neighborhood, the willingness to insure there is suppressed. The profit

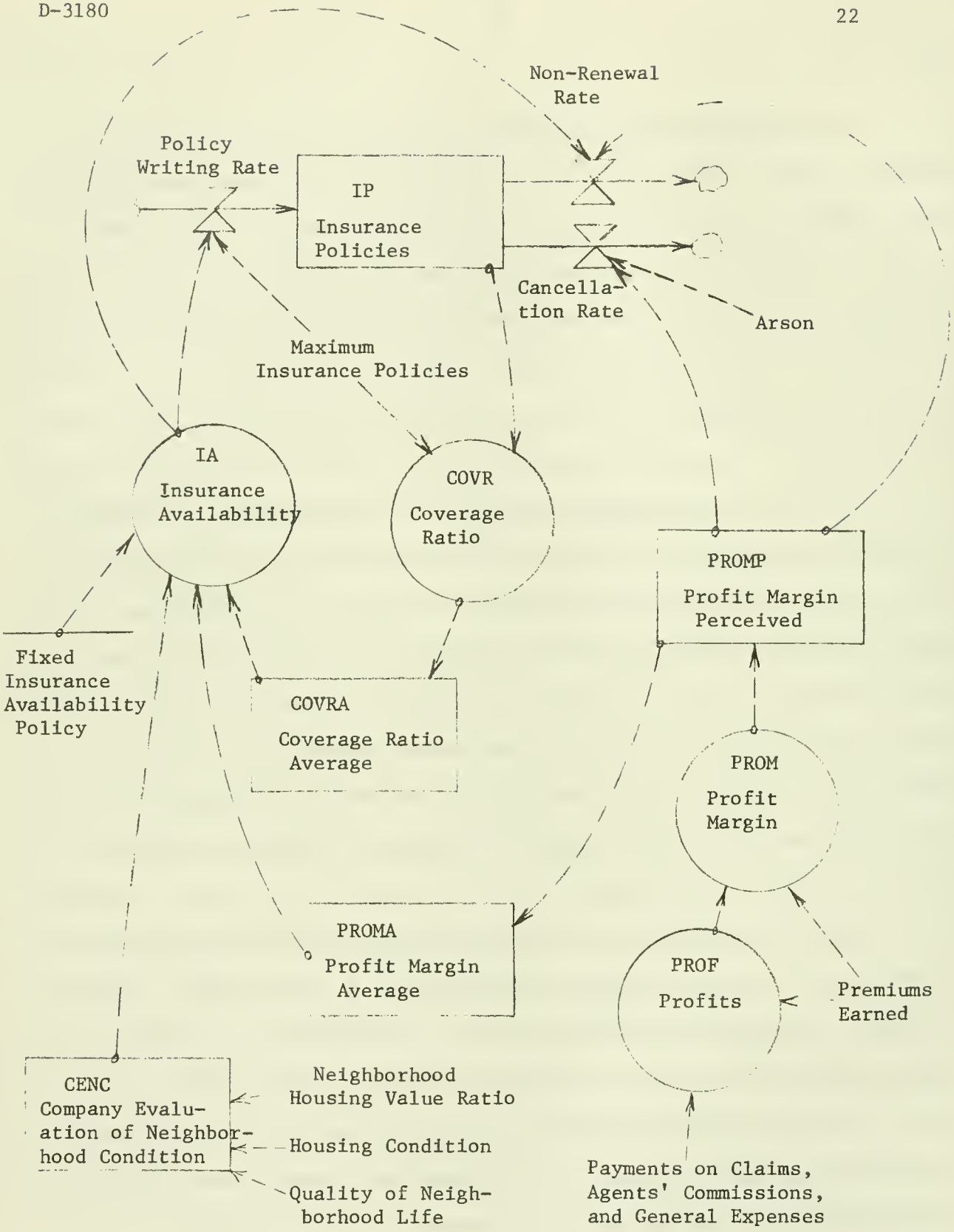


Figure 6: Insurance Sector

margin average is an indicator of the company's past financial performance in the community; it can have a strong downward influence on insurance availability when losses have been sustained for several years. In addition to these three normally operating influences, INSUR2 permits the implementation of a fixed (exogenous) insurance availability policy, which generally means a top-level decision to make insurance fully available regardless of circumstances or, alternatively, to immediately withdraw from the neighborhood completely and permanently.

The company's profits in an area are determined by revenue, in the form of premiums earned, and expenses, in the form of payments on claims, insurance agents' commissions, and other costs associated with servicing an area. The average profit in most neighborhoods is approximately 5% of the premium; a profit margin of 10% or more is considered unusually high and -5% or less is considered unusually low. On a standard homeowner's policy, the premium charged varies with the insured value of the house according to a "relativity curve" derived by company actuaries.[34] One such relativity curve--called the "premium earned table" in INSUR2--is shown in Figure 7.

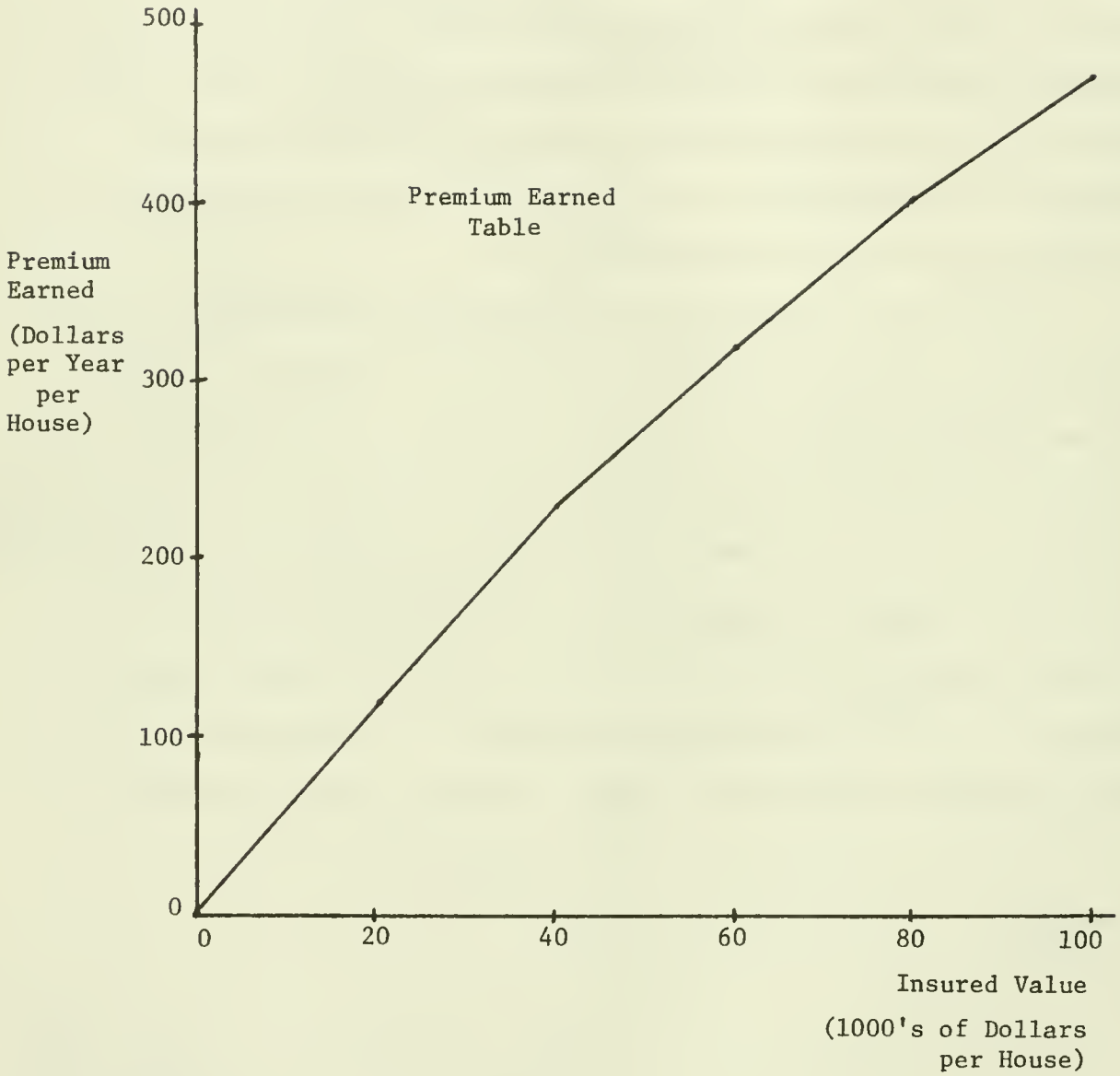


Figure 7: Premium Earned as a Function of Insured Value

3. CASE STUDY: MELROSE, MASSACHUSETTS

3.1 History of Melrose

The City of Melrose is located seven miles north of Boston and encompasses about 4.7 square miles. (A map of Melrose appears as Figure 8.) The land was first explored in 1628 and settled in 1633. By 1850, Melrose had a population of 1,260 and about 200 homes and became incorporated at that time as a township. The extension of a commuter rail through the middle of town made the area extremely attractive to many of the well-to-do and fashionable families of Victorian-era Boston, who enjoyed the beautiful isolated valley topography as a respite from the hubbub of the city. By the turn of the century, Melrose had grown to almost 13,000 people, split mainly between the rich merchants who lived in large single-family houses near the center of town and the middle class artisans, clerks, and servants who worked for them. Melrose was incorporated as a city in 1900 and grew rapidly until the stagnating influence of the Depression was felt in the 1930s.[35]

In 1930, Eva Osgood, the city planner, expressed a belief that Melrose was growing too fast to retain its individuality and its sense of elite separation. In this spirit, she stated, "It is a grave question just how many people a residential area should invite within its borders."[36] Indeed, by 1950 the population had increased to almost 28,000 and almost three-quarters of the available land area had been developed. Many upwardly mobile, middle-class residents who maintained the ideal of a neighborhood with the feel of a sparse rural area began to migrate to the

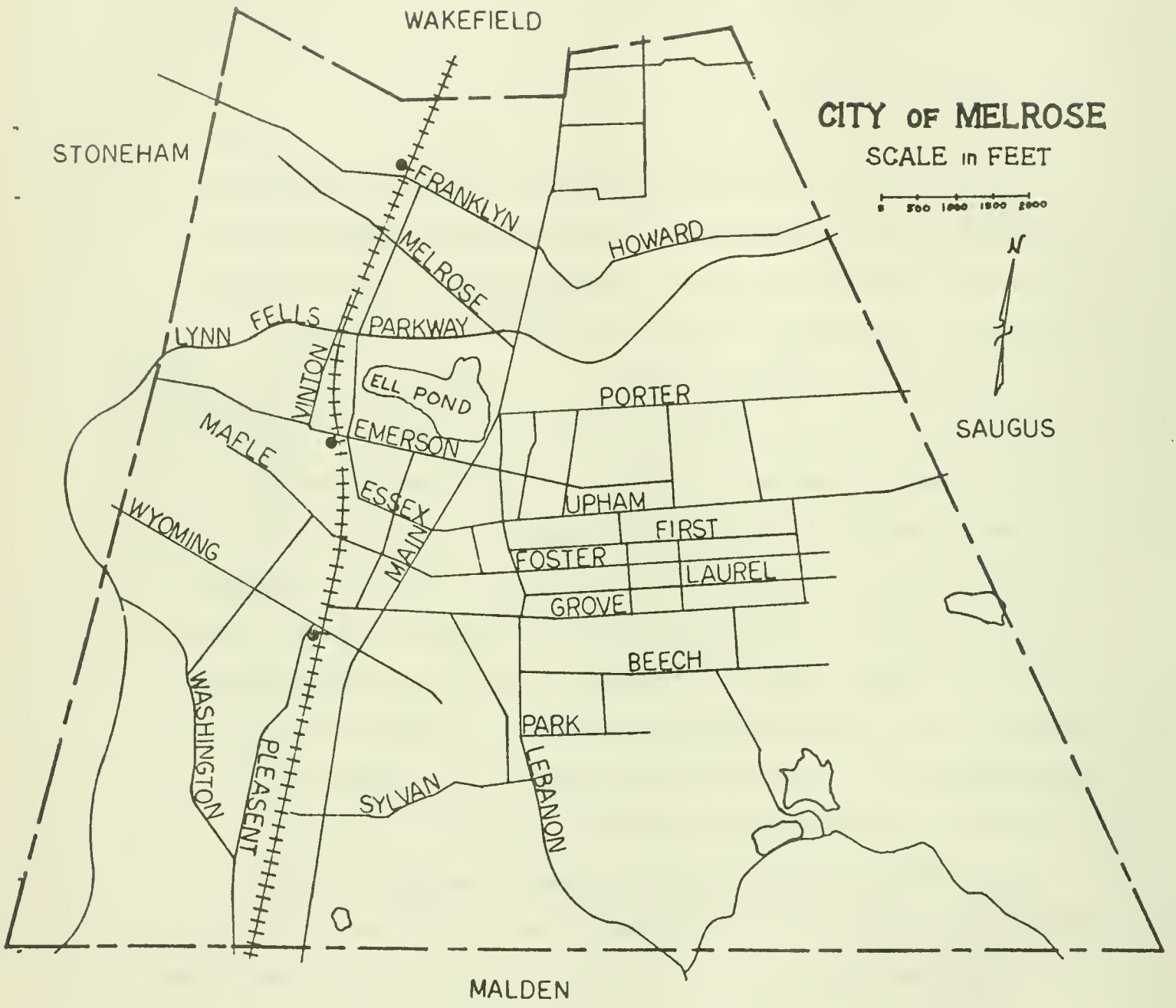


Figure 8: Map of Melrose

north, away from Boston. In their place came an inflow of young blue-collar workers and their families from industrial towns to the south of Melrose, like Malden. Housing turnover and conversion became common and a strong apartment boom persisted through the mid-sixties. From the south also came people of color: middle-class Asian-Americans and lower-class blacks and Puerto Ricans, who between them now account for about 2% of the total population.[37]

By the late 1960s, the special housing needs of the growing elderly population (many of whom are staunch republican Yankees, D.A.R. members and the like, and Melrosians by birth) were recognized, and the first of five large state-funded apartment buildings were constructed. By 1975, the city government recognized that the problems went beyond a housing shortage and that the steady 30-to-40-year decline in construction and investment in public facilities had taken its toll on the city. At the city's request, the Massachusetts Department of Community Affairs looked into the problem and agreed that "the effective life of [Melrose's] private housing, public facilities, and commercial center was being drained over time."[38] In response to this fact, a Master Plan was drawn up in 1976 with the goal of creating a downtown "Community Service District" which would "provide a place for the various central services needed by the homes and neighborhoods of the city."[39] By 1978, a Community Development Block Grant of one million dollars per year for three years had been approved by the federal government. Approximately half of this money is going to the rehabilitation of deteriorating lower and middle class housing in and around the downtown area. The remaining half is split roughly evenly between improvement and construction of public facilities (parks,

playgrounds, and a parking structure) and historic preservation of old Victorian buildings.[40] The city's leadership feels that by presenting the image of Melrose as a picturesque Victorian town, the cycle of disinvestment will be reversed, just as it was as a result of similar projects in the towns of Salem and Newburyport, Massachusetts.[41]

The social attributes of the quality of life in Melrose seem to have changed along with the population mix. Religious and ethnic tensions have become apparent and the town is much more politically factionalized than it was in the past. Vandalism and other forms of youth crime are quite prevalent, and an arson ring was discovered not long ago. On the whole, Melrose might be described as a working-class community interspersed with professionals and students (who commute daily into Boston) and elderly people.

3.2 Some Facts Concerning Melrose

Melrose was chosen from a group of 17 suburbs which are within a 12-mile radius of downtown Boston. In looking for the ideal transitional residential community, a number of criteria were established (drawing from attributes published by the Census), and Melrose emerged as the "most average" transitional suburb with the fewest peculiarities. Some of the more interesting facts are: (1) The population of Melrose has declined from a peak of over 33,000 in the mid-70's to its present level of about 31,000; (2) The city's available land area is 95% developed; (3) Only 5% of the tax base is non-residential, and only about 6% of the land area is zoned for business or industrial uses. [Eva Osgood wrote: "Melrose has

deliberately chosen to be a city of homes...The entrance of new industry has been discouraged so that today there is less manufacturing than in any nearby city or town."[42]]; (4) The housing stock is relatively old, 68% having been built before 1940; (5) About 70% of the total housing units are owner-occupied, but about three-quarters of the units built between 1960 and 1970 are rented; (6) About three-quarters of the adult population graduated high school; (7) The median income figures are consistently lower than those for the state as a whole but well within the middle income range. In 1970, less than 4% of the families were below the official poverty level; (8) About 13% of the population was in the over-65 category in 1970, which was on the high side for the 17 communities considered, but not unusually so (Belmont, Chelsea, and Milton have higher percentages).[43]

3.3 Parameters Used to Describe Melrose

The Melrose-adapted model is initialized in 1900, the year of the city's incorporation and the beginning of official population and housing censuses there at least every ten years. A correctly initialized model should demonstrate both the stable growth conditions of the earlier part of the century and the slow-down to transition of the last forty years or so. Although the numerical data on Melrose prior to 1950 are incomplete and highly aggregated, there are descriptive data (such as the fact that the population transition has involved a decrease in the white-collar population and an increase in the blue-collar population) that provided guidance in setting initial values for population and housing. These

initial values were chosen and the associated rates normalized (relative to the stable period of 1900-1930) such that:

(1) The smooth growth during the early 1900s in population and housing (about 1 1/2% per year) was accurately reproduced;

(2) The observed population and housing distributions in recent years were also reproduced;

(3) The parameters used for the various population and housing rates were reasonable, given recent statistics and accounting for the effects of increasing land occupancy on construction, demolition, and renovation.

The resulting initial conditions and relevant population and housing rate "normals" (normal fractional changes per year of a given level) are displayed in Table 1.

There are a number of other parameters that distinguish between classes of population and housing, including normal housing densities (people per house), owner-occupancy fractions, housing market values and replacement costs, and rates of wear and tear, property crime, and repairs.

The housing density, owner-occupancy, and market value parameters were set according to the actual differences that exist among three groups of census tracts in the general vicinity of Melrose. The definitions of upper, middle, and lower class were thus fashioned relative to the inner suburban residential region north of Boston of which Melrose is a part. Melrose is seen as lying somewhere along a kind of continuum on which the wealthy suburb of Winchester is at one extreme and the poorer areas of Lynn are at the other extreme.

Table 2 displays the parameters mentioned above. It should be noted that normal household sizes in the area have been steadily shrinking since 1940 or so, at a rate of about 4% of their pre-war values per decade.

This fact was incorporated into the model, and its only effect is to improve the historical accuracy of the simulated total population.

All model parameters which concern the land area and its use (shown in Table 3) were derived from a zoning map of Melrose. The assumption of a constant amount of land per house was made for reasons of simplicity; but the fact that the maximum size of lots varies considerably (ranging from .17 acres in the lower class areas to .34 acres in the upper-class areas) was taken into account when computing the zoning limits.

Additional model constants of interest are presented in Table 4 and are based on a mixture of solid information and rough estimates. For instance: Typically about 25% of insurance claims are due to property crimes;[44] with a few additional assumptions--such as, arson normally accounts for 9% of all property crimes--it was possible to derive the various normal property damage figures.

Finally, the various Melrose housing programs have been included in the model, as shown in Table 5. The parameters are based on figures made available by the Melrose City Planning Office. In all cases, these programs are assumed to be phased out completely by 1990.

Table 1: Initial Conditions and Rate Normals in the Population and Housing Sectors

(1) Initial Conditions:

Total population = 12,962 (100%)

* Upper class population = 2,981 (23%)
* Middle class population = 8,166 (63%)
* Lower class population = 1,815 (14%)

Total housing = 2,884 (100%)

* Upper housing = 727 (25.2%)

  Middle housing = 1,856 (64.4%)

  * Type 0 = 1,485
  * Type 1 = 371

  Lower housing = 301 (10.4%)

  * Type 0 = 3
  * Type 1 = 241
  * Type 2 = 57

(2) Rate Normals:

Population--

All three arrival normals = 3.0% per year

All three departure normals = 2.1% per year

Housing--

Upper housing construction normal =	2.6% per year
Middle housing construction normal =	2.6% per year
Lower housing construction normal =	0.1% per year
Upper housing obsolescence normal =	1.5% per year
Middle housing type 0 obsolescence normal =	1.0% per year
Middle housing type 1 obsolescence normal =	1.0% per year

Middle housing type 0 demolition normal =	1.3% per year
Middle housing type 1 demolition normal =	0.8% per year
Lower housing type 0 demolition normal =	2.2% per year
Lower housing type 1 demolition normal =	2.5% per year
Lower housing type 2 demolition normal =	3.0% per year
Middle housing renovation normal =	0.2% per year
Lower housing type 1 renovation normal =	0.2% per year
Lower housing type 2 partial renovation normal =	0.1% per year
Lower housing type 2 total renovation normal =	0.1% per year

The housing rate normals used to describe Melrose imply the following approximate lifetimes (number of years between construction and demolition) of dwellings under conditions like those of the early 1900s:

Originally upper housing lifetime	=	200 years
Originally middle housing lifetime	=	105 years
Originally lower housing lifetime	=	45 years

Table 2: Population and Housing Parameters Determined from Melrose Vicinity Census Information

People per house normals (prior to 1940):

People per upper house normal =	4.1
People per middle house normal =	4.4
People per lower house normal =	6.7

House ownership (owner-occupancy) fractions:

Upper class house ownership fraction =	.85
Middle class house ownership fraction =	.77
Lower class house ownership fraction =	.40

Housing market value normals (in 1970 dollars, assuming assessed value = 35% of market value):

Upper housing market value normal =	$103,000/house
Middle housing market value normal =	$ 66,000/house
Lower housing market value normal =	$ 42,000/house

Table 3: Land Use Parameters

Land area = 2,150 acres

Land per house = .25 acres/house

Zoning limit for upper housing = 4,600 houses

Zoning limit for middle housing = 6,592 houses

Zoning limit for lower housing = 2,944 houses

Table 4: Additional Parameters of Interest

In the Quality of Neighborhood Life Sector:

All indices--quality of neighborhood life, neighborhood services, neighborhood cohesiveness, class disparity, residential stability, average social class, and neighborhood organization--have "normal" values of 1.

However, the initial value of average social class is 1.09, indicating a tip toward the upper class; As a result, the initial value of neighborhood services is 1.07 and the initial value of quality of neighborhood life is 1.04.

In the Insurance Sector:

Initial value of insurance policies = 2,750 policies
Policies issued per house = 1 policy/house
Involuntary non-renewal normal = 4% per year
Cancellation normal = 5% per year
Arson-to-claims ratio normal = 2.4%

Profit margin initial = 9%
Profit margin normal = 5%
Standard fraction of replacement cost insured = 70%
Neighborhood housing value ratio normal = 1.3

Agents' commission fraction = 20% of premiums earned
General expenses = $2,000 per year
All three wear and tear insurability fractions = .25

Under Property Damage and Repair:

Upper housing wear and tear normal = 0.82% of repl. cost/year
Middle housing type 0 wear and tear normal = 0.82%
Lower housing type 0 wear and tear normal = 0.82%

Middle housing type 1 wear and tear normal = 0.91%
Lower housing type 1 wear and tear normal = 0.91%

Lower housing type 2 wear and tear normal = 1.00%

Upper class arson normal = .004% of repl. cost/year
Middle class arson normal = .006%
Lower class arson normal = .013%

All 3 misc. property crime normals = .065% of repl. cost/year

Upper housing repair fraction normal = 90%
Middle housing repair fraction normal = 87%
Lower housing repair fraction normal = 77%

Individual upper housing repair money limit = $1,100/house/year
Individual middle housing repair money limit = $600/house/year
Individual lower housing repair money limit = $300/house/year

Upper housing replacement cost = $108,000/house
Middle housing type 0 replacement cost = $69,000/house
Middle housing type 1 replacement cost = $87,000/house
Lower housing type 0 replacement cost = $44,000/house
Lower housing type 1 replacement cost = $56,000/house
Lower housing type 2 replacement cost = $71,000/house

Table 5: Representation of Melrose Housing Programs

(1) Lower housing construction program: Adds 4% per year to the lower housing stock. Begins in 1968 and is phased out starting in 1972;

(2) Lower housing demolition program: Removes 2% per year from lower housing stock. Begins in 1968 and is phased out starting in 1972;

(3) Lower housing renovation program: Renovates lower class housing to middle class housing at a rate of .8% per year. Begins in 1978 and is phased out starting in 1980;

(4) Housing repair programs: Performs $200,000 of repairs to lower housing and $100,000 of repairs to middle housing per year. Begins in 1978 and is phased out starting in 1980.

4. SIMULATING AND EXPLAINING COMMUNITY CHANGE

4.1 Base Run Description

A base run of the INSUR2 model parameterized to represent Melrose produces the plotted output shown in Figures 9 through 13.

Figure 9 compares the actual census data on total population and housing (dwellings) with the corresponding simulated data. The divergence of the simulated housing series from actual values during the 1970-1976 period is probably due to unevenness or "chunkiness" in implementation of the construction and demolition programs in real life, which was not reflected in the model. By 1978, the two housing series match closely again; the Melrose city planner stated that housing has not decreased since that time.

Figures 10 through 13 illustrate the situation in more detail and carry the simulation forward to the year 2020. In Figure 10, housing grows steadily until the 1940s, peaks at 7,400 dwellings in the 1980s, and then declines to 6,800 dwellings by 2020. Population peaks at 33,000 people in the mid-1970s and falls to 26,500 by the end of the run. The upper and middle class populations start to decline in the late 1960s and early 1970s while the lower class population increases monotonically throughout the run. A similar story can be told for the housing figures, which show a steady filtering-down of dwellings to the lower class, especially after 1940. On an aggregate level, then, Figure 10 describes the growth and decline of Melrose in terms of population and housing and their respective sub-categories. The accelerating shift since 1940 to lower class

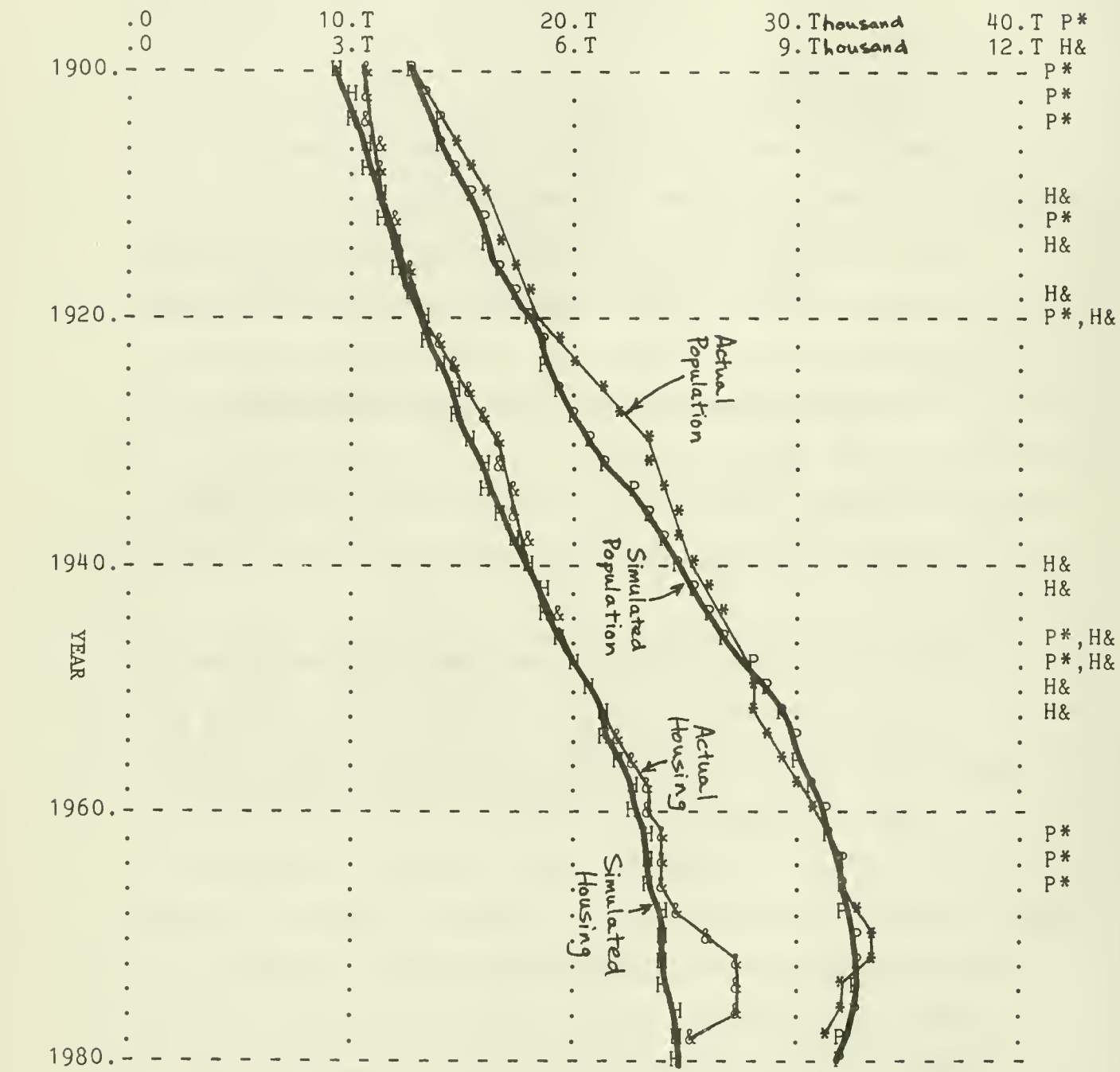


Figure 9: Comparison of Actual and Simulated Time Series

FILE INSUR2 NEIGHBORHOOD INSURANCE MODEL 12/11/79 18:15 BASE

U=U,M=M,L=L,POP=P,UH=1,MH=2,LH=3,HSG=H

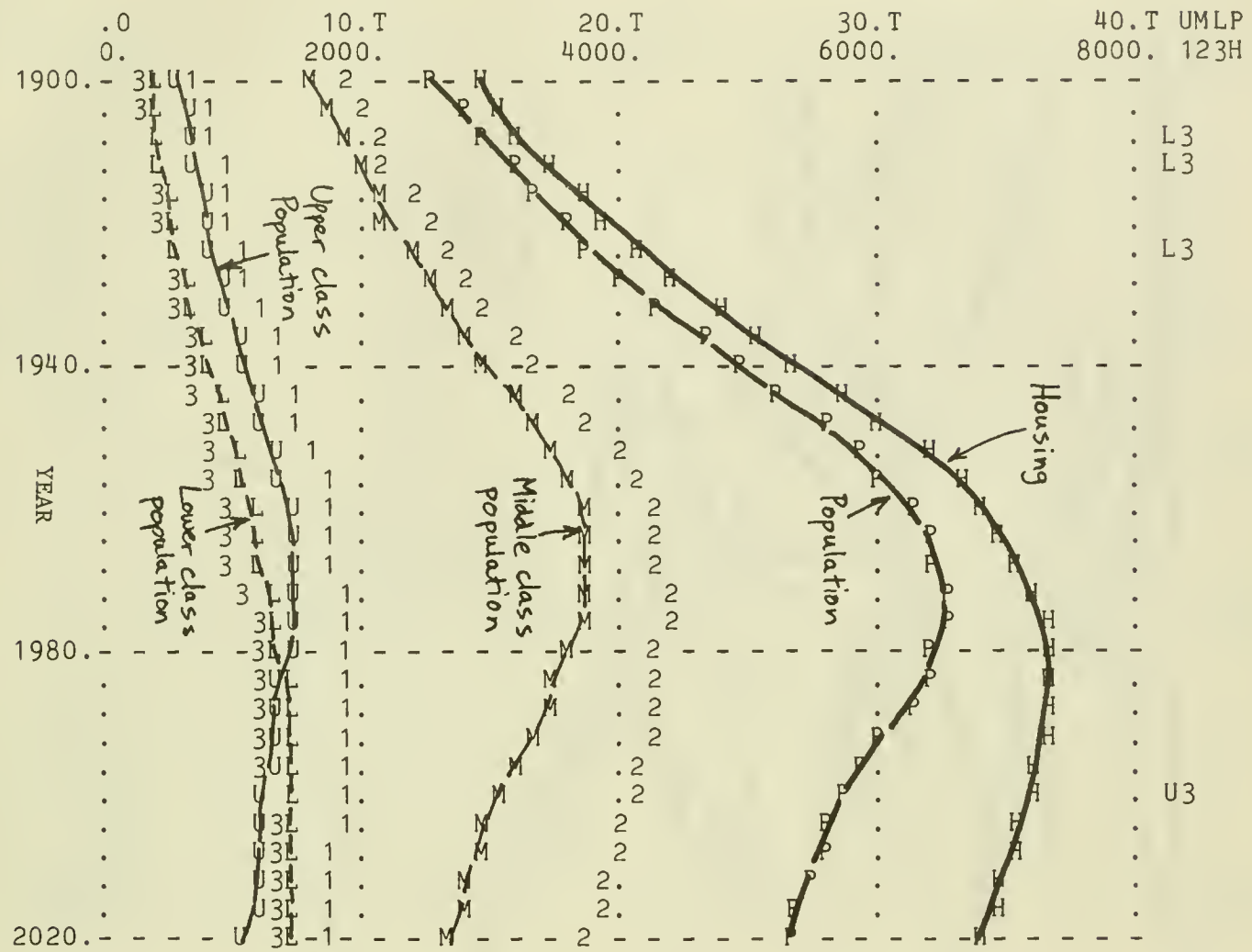


Figure 10: Base Run -- Population and Housing

UHC=0,UHO=1,MHC=2,MHO=3,MHD=4,MHR=5,LHC=6,LHD=7,LHR=8

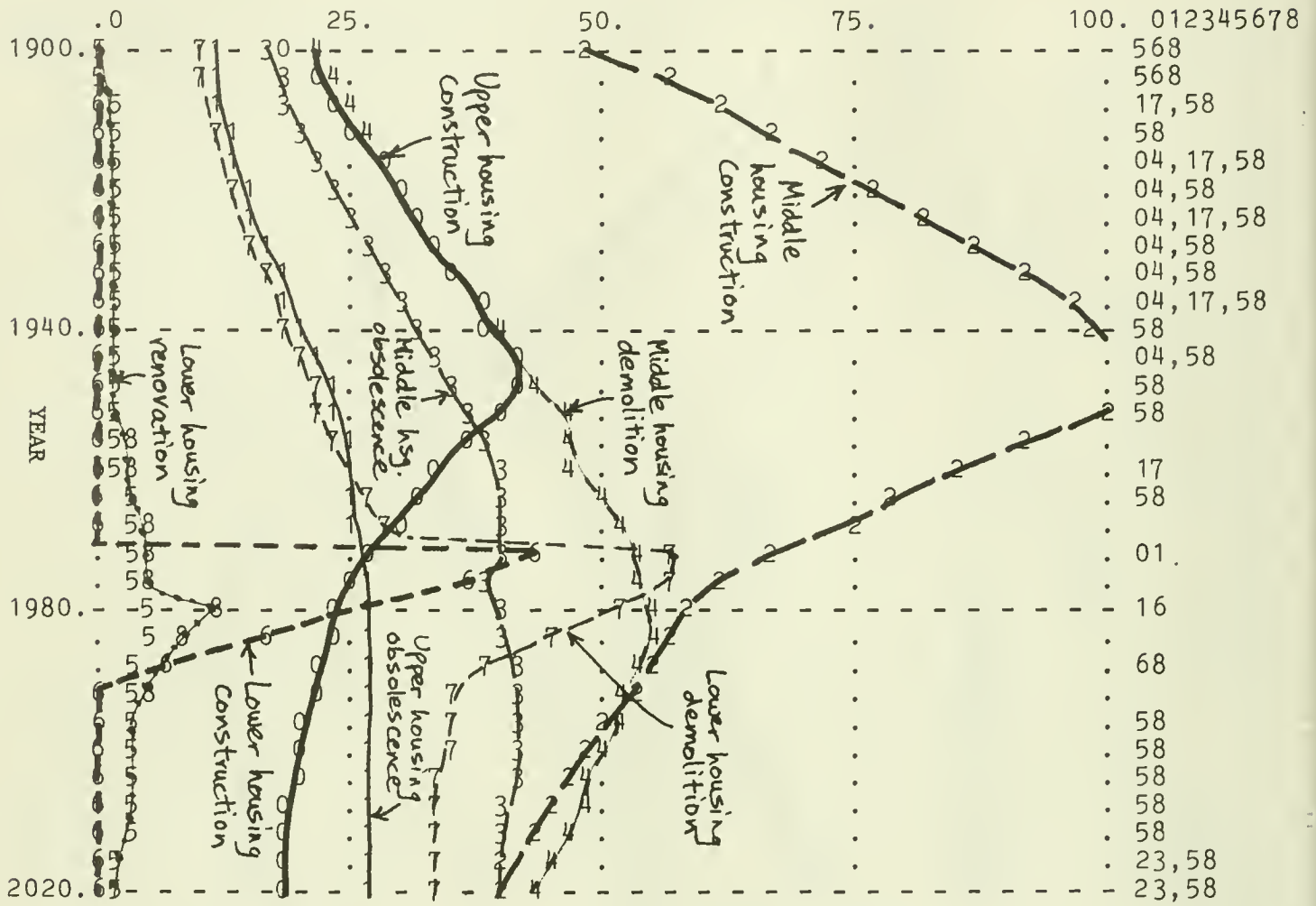


Figure 11: Base Run -- Housing Rates

QNL=Q, NS=S, RS=T, PDRXR=R, PCPH=P

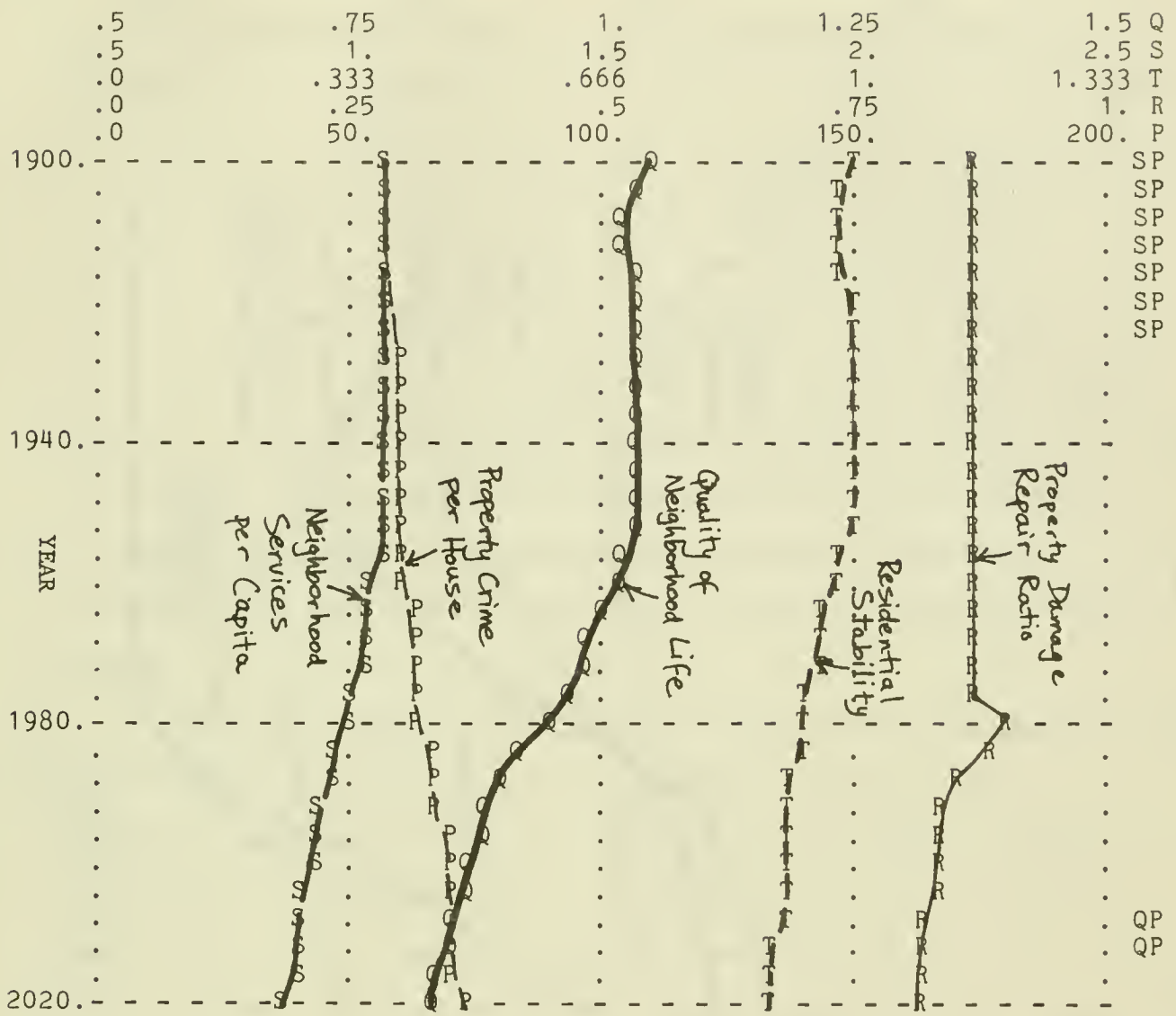


Figure 12: Base Run -- Quality of Neighborhood Life

FILE INSUR2 NEIGHBORHOOD INSURANCE MODEL 12/11/79 18:15 BASE

IP=P, IA=A, PROM=M, PROF=F, NHVR=V, CENC=E

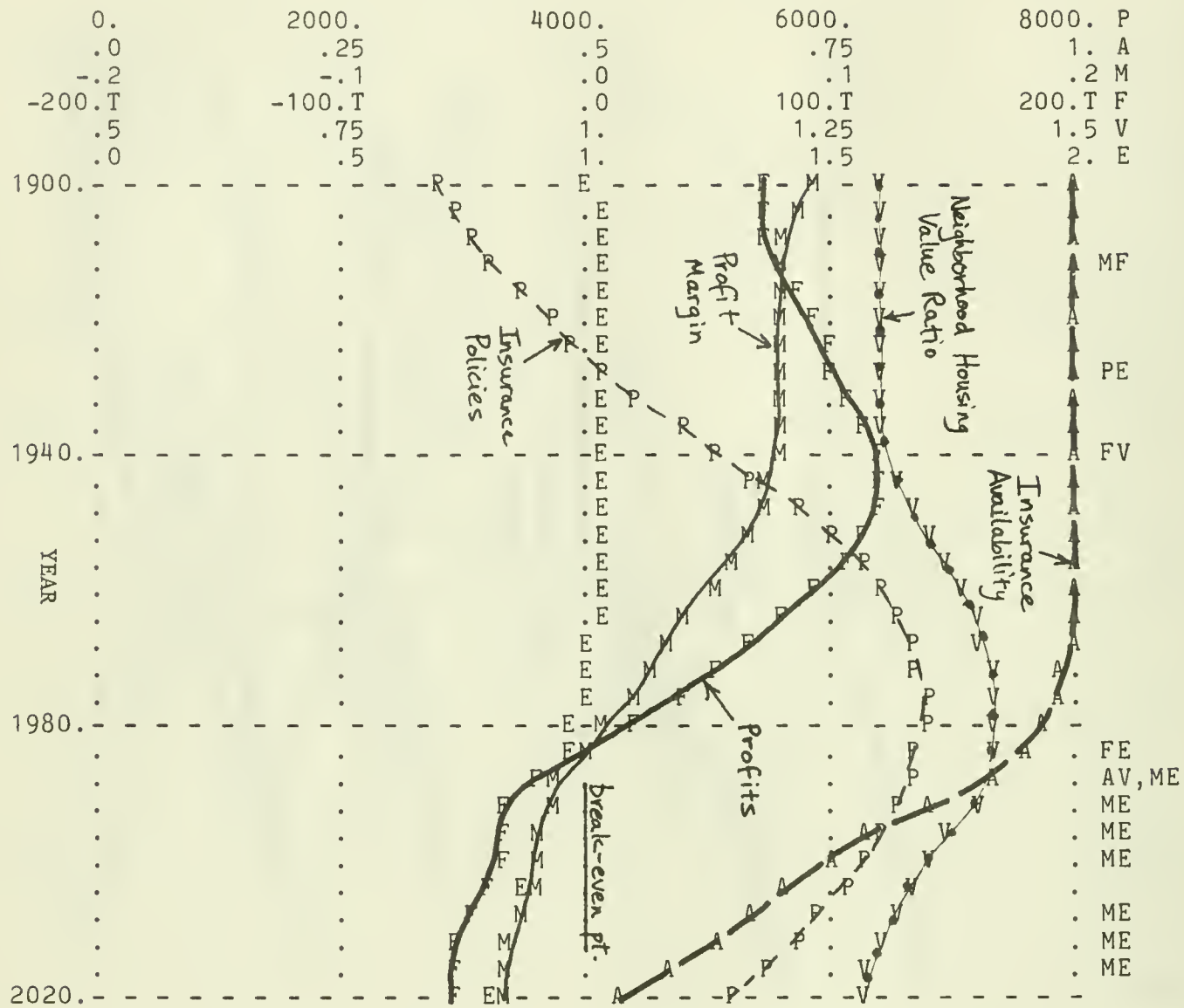


Figure 13: Base Run -- Insurance

population and housing and away from upper and middle class shall be referred to as "the transition".

Figure 11 shows how the various housing rates change over time. Upper and middle housing construction peak in the mid-1940s and then decline to below their 1900 values by 2020. The upper and middle obsolescence rates climb steadily (except for a small dip in the middle housing obsolescence rate in 1978 due to the repair program initiated then) and then level out in the 1980s. The demolition patterns for middle and lower housing generally follow their respective housing levels, except for the large increase of lower housing demolition during the program years. The lower housing construction and renovation rates also reflect the recent programs.

Figure 12 shows the change in various quality of life parameters. These parameters all show negligible change until the 1950s, when residential stability and neighborhood services, and therefore, the quality of neighborhood life, start a decline that continues to the end of the run. Property crime per house climbs from $57 per year to $72 per year. The ratio of repairs to damages is remarkably stable throughout the run, rising only when the repair program is instituted and declining thereafter because of diminishing values of owner-occupancy and quality of neighborhood life.

Figure 13 illustrates the insurance industry's theoretical involvement in Melrose over the years. The profit margin is relatively stable at 8 to 9% throughout the earlier part of the century but then falls steadily for the rest of the run; the break-even point is crossed in the mid-1980s, and losses amount to more than 3 1/2% of premiums earned by 2020.[45] Losses in the community, along with the worsening housing

conditions and quality of neighborhood life, prompt a gradual withdrawal of insurance; insurance availability falls to about 50% by the end of the run. Until the decline of insurance availability, policies in the community increase along with the number of houses. Profits increase with insurance policies until the mid-1940s (when a peak of $120,000 per year is reached), after which they decline in accord with the falling profit margin. Finally, the neighborhood housing value ratio rises from its 1900-1940 value of 1.3 (comfortably above the "morally hazardous" region less than 1), peaks in the 1970s and 1980s at 1.4, and then declines back to its initial level by 2020. This pattern reflects change in real market values which are a function of supply and demand.

The base run seems to correspond well to the first few stages of the transition process described in the literature and also to the primarily descriptive data concerning Melrose's past.[46] With confidence that the model produces realistic behavior, one can proceed to explain the observed phenomena in terms of the model's feedback structure. That is the purpose of the next section.

4.2 A Theory of Community Change

The Role of Population, Housing and Land

The theory of community change to be discussed here uses as its jumping-off point the central "filter-down" theory presented by Forrester in his book on urban dynamics.[47]

Figure 14 is a simplified diagram of the interactions of population, housing, and land in INSUR2. During a normal period of growth in an affluent area (such as Melrose in the early 1900s), the community's good location and high quality of life draw people in, roughly in proportion to the number of households presently there. Similarly, the presence of choice land parcels encourages the construction industry to continue to develop the area for its upper and middle class inhabitants by expanding upon the existing infrastructure. This explains the two small positive loops in Figure 14 which are the heart of the growth process. Housing construction and in-migration are kept in check by the households-to-housing ratio (or the "housing balance", as it is called in INSUR2), which represents both the physical (vacancies, crowding) and economic (price) manifestations of the balance between housing demand and housing supply. When this ratio is high, the housing market is tight, which will tend to discourage in-migration while it encourages construction. When this ratio is low, vacancies are abundant and housing prices are low, which has the opposite effect. As the housing stock ages, some fraction of the dwellings will be converted to lower class housing. When the housing market is tight, however, there will be less filter-down than if demand is slackening. This is another mechanism that keeps people and houses in balance with one another.

If there is a housing demand and supply imbalance, insurance company profits will be affected. Wear and tear is partially a function of how intensively the housing stock is being used, or its "exposure". When more people than usual are using the facilities of a house, there will be more breakage, water damage, and accidental fires. Some of these damages

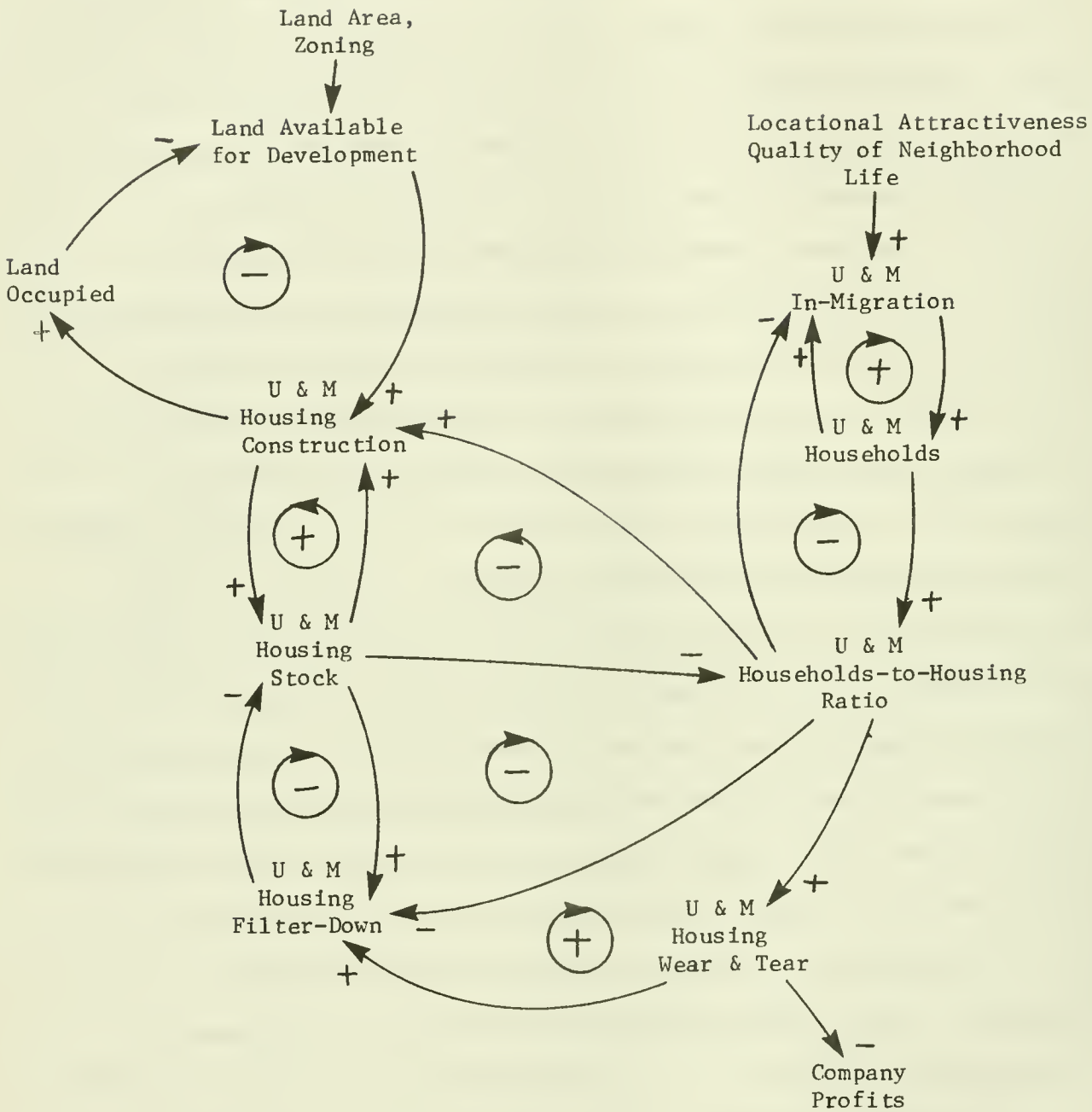


Figure 14: Community Growth Constrained by Land Availability

("U & M" = Upper and Middle Class)

will be covered by a homeowner's policy, and the insurance company will feel the burden. In addition, an increased rate of wear and tear can lead to faster obsolescence of the upper and middle housing stock, which will reduce its size and may lead to more crowding than there was previously.

As the land area becomes more developed and land prices for choice parcels are bid up, housing construction will start to decline. (Recall that this occurred in Melrose beginning in the 1940s, as shown in Figure 11.) Since upper and middle class houses can no longer be built quickly enough to satisfy existing demand, demand will have to be diminished somehow. Locational attractiveness and the quality of neighborhood life will in general still be high, so it falls to the mechanisms of crowding and high housing prices to bring the housing and population growth rates back in line with one another.

While the construction slowdown is in progress, upper and middle houses continue to age and obsolesce as they used to. In effect, the construction rates of the past (embodied in the present levels of upper and middle housing) will be reflected in the present rate of conversion to lower housing. Since the construction rates of the present are lower than those of the past, upper and middle housing will start to grow at a slower rate than lower housing. The theory thus implies that the effect of land as a constraint on construction is to initiate a transition away from upper and middle housing and toward lower housing.* As this housing transition

* Of course, it is possible for a community fearful of transition to pass zoning ordinances that would prevent the down-conversion of old homes. Since these homes are no longer fit for upper or middle class habitation, they could be renovated or demolished. However, both of these activities are expensive for the owner. Most owners would prefer to make an easier profit by renting the house to lower class inhabitants; hence, the reluctance to zone out even those individuals who are seen as a detrimental influence on the community.

occurs, the equilibrating forces of supply and demand will lead to a corresponding population transition.[48]

The Role of Quality of Neighborhood Life

In addition to the mechanisms discussed above, INSUR2 posits the importance of the quality of neighborhood life in affecting the community's destiny. In Figure 15, a number of positive loops are shown that could exacerbate the decline of the community.

The loops drawn with thick solid lines in Figure 15 represent the feedback between the population transition and the quality of neighborhood life. As the population transition takes place, the community becomes less wealthy and more heterogeneous. In terms of variables in INSUR2, the average social class declines, the lower class fraction increases, and class disparity increases. These changes can lead to a lower quality of life through the channels shown in Figure 5, along with the direct effect of a growing lower class population on property crime. A lower quality of life will, in turn, speed the population transition, primarily because the three social classes have different levels of expectation or tolerance.

Of the population variables mentioned above, class disparity has the greatest potential for damage, for the following reasons:

(1) The degree of heterogeneity will change more quickly than either the lower class fraction or the average social class. for example, it may only take a small inflow of "undesirables" into a formerly pristine neighborhood to produce polarization and a feeling that the neighborhood has been invaded;

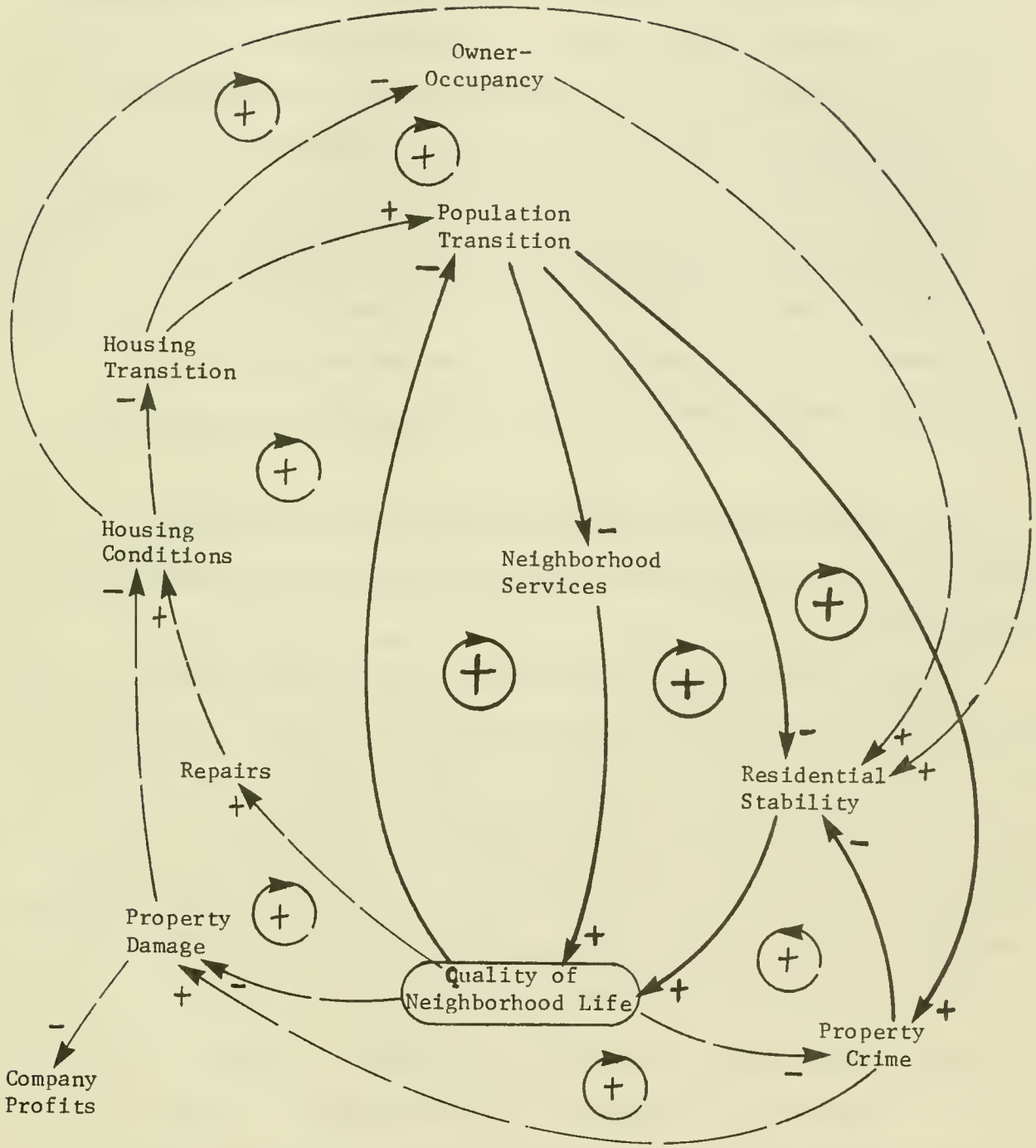


Figure 15: The Role of Quality of Neighborhood Life in the Transition

(2) Class disparity is the most important element of neighborhood cohesiveness, and a decline in average social class or an increase in crime might actually tend to increase cohesiveness;

(3) By decreasing neighborhood cohesiveness, an increasing level of class disparity can affect the quality of neighborhood life adversely by both decreasing residential stability and increasing factionalization within and ineffectiveness of community organizations that provide services. Increasing property crime generally acts adversely only by decreasing stability; declining average social class only by decreasing services.

The remaining loops in Figure 15 indicate how the quality of neighborhood life is linked with housing conditions and property crime, in a feedback sense.

Available data indicate that housing repair is usually more a matter of willpower, commitment to the community, and "interest in the parcels" (which all reflect the quality of neighborhood life) than availability of savings or financing, in anything but the poorest communities.[49] However, maintenance activity in Melrose, a community with an ostensibly declining quality of life, has not noticeably dwindled since 1960.[50] Furthermore, unrepaired damages often take many years to accumulate to significantly affect housing conditions. In general, then, the effect of quality of neighborhood life on housing conditions is relatively weak and slow, and the indirect effects of housing condition on quality of neighborhood life shown in Figure 15 are not necessary for its decline.

The small positive loop relating property crime to quality of neighborhood life and residential stability may be important in some communities and not in others. Insurance companies are certainly worried about the deleterious effects of quality of neighborhood life on property crime;[51] but the positive loop generally will not gain much momentum until the quality of neighborhood life is already fairly low. Crime therefore has its greatest impact when the community is well into its period of decline.

The Two Realms of Change

The preceding subsections indicate that the INSUR2 model embodies two interlocking, but conceptually distinct, theories of community change.

The filter-down theory deals with physical and economic forces. It attributes community decline to the saturation of land, which leads to a housing transition and, therefore, to a population transition. Since this theory states that downward movement is based on decreasing land availability, a new equilibrium should be reached once the housing stock adjusts to the constraint on construction imposed by a fully-developed land area. This suggests that a physical-economic theory of community change can explain the initial but not the latter stages of decline.

The quality of neighborhood life theory deals with social and political forces. It attributes community change to the dynamics associated with the population mix. If the population becomes more heterogeneous, there will be some breakdown of social cohesiveness, which leads to a lower quality of life and an exodus of the upper and middle

classes. As the lower-class fraction increases, so does crime, which drives the quality of life still lower. The vicious cycle may not end until the community has been burned out and abandoned, as in the South Bronx. If crime is not such a serious problem, though, the increasingly lower-class community will re-stabilize as it becomes more homogeneous. This socio-political theory explains important aspects of community change, but it cannot explain how a population transition is set into motion.

The two theories of community change outlined above complement each other and make up for each other's shortcomings when integrated into a single framework, as in INSUR2. More specifically:

(1) While the physical-economic realm has a preponderance of negative, controlling loops, the socio-political realm has many positive, destabilizing loops;

(2) The physical-economic realm is constrained by land, and the socio-political realm includes a limit to which class conflicts can develop; and

(3) The transition is initiated by the filter-down process, but it can only be sustained as a result of social problems that disrupt the otherwise orderly process of equilibration. (The next section demonstrates this point.)

4.3 The Self-Sustaining Transition

The Melrose-adapted model was tested under a number of conditions to determine why the continuously deteriorating situation of the base run occurs. The two key results of this analysis are:

(1) The effect of land availability on construction is critical in triggering the transition. As long as growth continues smoothly, unhampered by a land constraint, the population and housing distributions do not change;

(2) In the case of an originally well-to-do community like Melrose, the downward movement will only become sustained if it induces a breakdown of social cohesiveness. The importance of the class disparity/neighborhood cohesiveness link was confirmed by a test in which only that link was cut. Simulation results appear as Figures 16, 17, and 18. A comparison with the base run indicates that rather than declining continuously--

- Total population and housing stabilize by the year 2000.
- The sum of the upper class and middle class fractions stabilizes at 77% by the year 2000 (compared to a final value of 72% in the base run), after declining seven percentage points during the transition.
- The quality of neighborhood life declines only slightly starting in 1960 and reaches its low point in 1990.
- The profit margin declines from 8 1/2% to 4% by 1980 and remains stable thereafter. As a result, insurance remains fully available throughout the run.
- The neighborhood housing value ratio remains near its high 1980 value until the end of the run.

The main reason for the profit margin decline in this run is the effect of overuse on wear and tear of the housing stock as the housing market tightens. In the absence of the class disparity effect on neighborhood cohesiveness, the forces for decline in the model do not depress the quality of neighborhood life enough to let the effect of property crime gain momentum. As a result, the slight decline in quality of neighborhood life accounts for only about one-quarter of the total decline in profit margin.

U=U,M=M,L=L,POP=P,UH=1,MH=2,LH=3,HSG=H

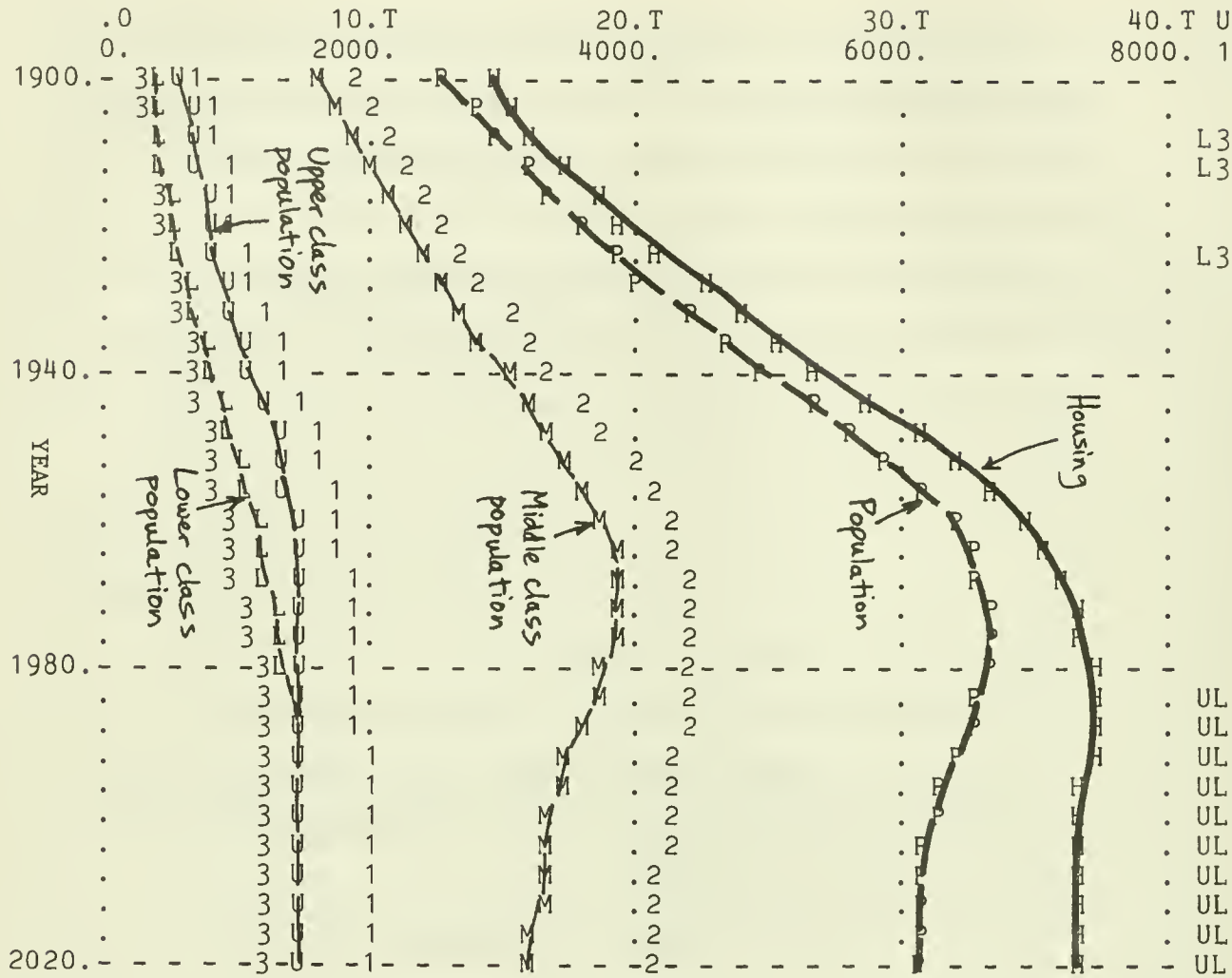


Figure 16:

No Class Disparity/Neighborhood Cohesiveness Effect -- Population and Housing

QNL=Q, NS=S, RS=T, PDRXR=R, PCPH=P

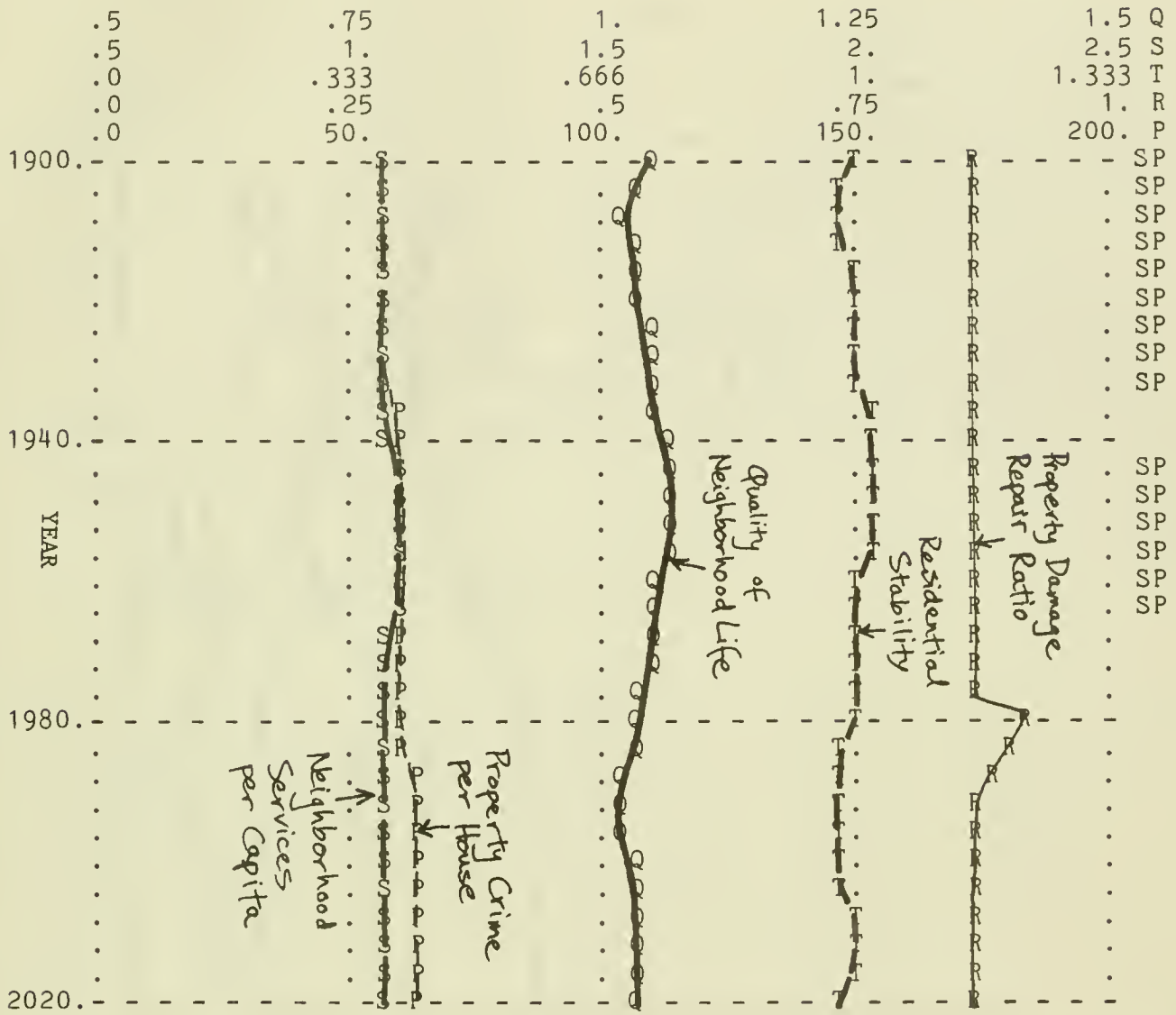


Figure 17:

No Class Disparity/Neighborhood Cohesiveness Effect --
Quality of Neighborhood Life

IP=P,IA=A,PROM=M,PROF=F,NHVR=V,CENC=E

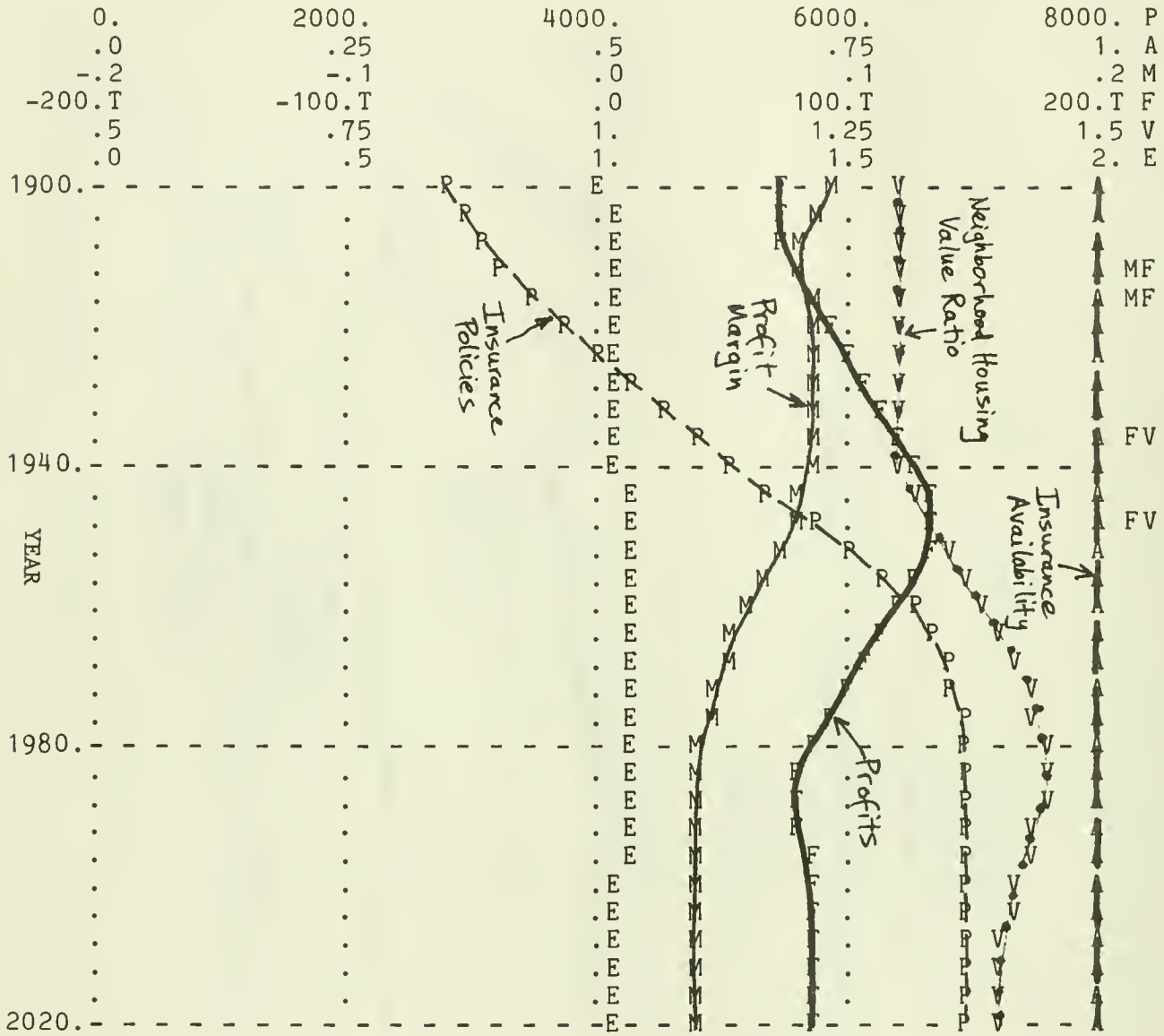


Figure 18:
No Class Disparity/Neighborhood Cohesiveness Effect — Insurance

The results of this test of the model are quite similar to the behavior of a filter-down model of community change, in which no quality of life effects are included. They indicate that a community like Melrose can avoid an extended period of decline if the changing population mix does not severely damage the social and political ties that are necessary for the residents' satisfaction and commitment. When the transition is accompanied by a breakdown of social cohesiveness, however, the turnover of people and houses can run out of control and destroy, rather than simply alter, the character of the community.

4.4 The Role of Insurance Availability

Figure 19 is a causal-loop diagram of the determinants of insurance availability and its effects. The negative loop at the top of the diagram demonstrates how the company can cut its losses: if losses increase, insurance availability will decrease, so that there are fewer policies outstanding and therefore fewer claims and ensuing losses. The positive loops demonstrate the accelerating nature of insurance withdrawal. First, when a decline in insurance availability is perceived in the community, there will tend to be more arson-for-profit; this will increase the company's losses and lead to a faster withdrawal. Second, if insurance is becoming difficult to obtain, people who wish to buy homes will look elsewhere; this will speed the transition to a renter-dominated and generally poorer community. A speedier transition means more immediate losses for the company, a lower company evaluation of neighborhood conditions, and more arson. All three of these effects lead to further withdrawal of the insurance company.

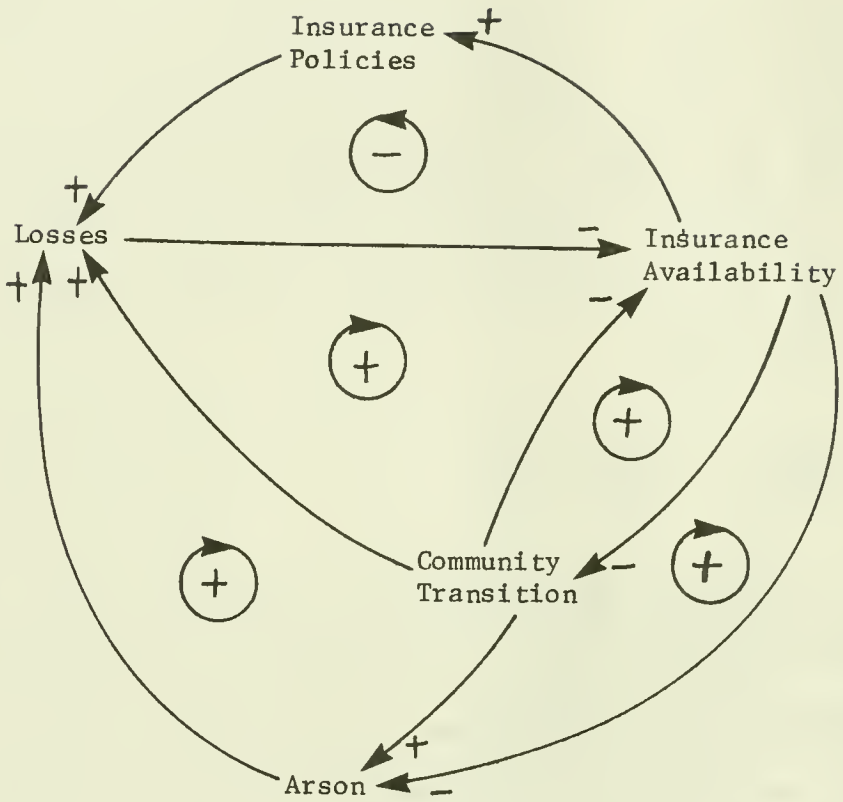


Figure 19 : Insurance Company Withdrawal During the Transition

5. ALTERNATIVE FUTURES

In this section, a number of "what-if" questions about the future of Melrose will be explored by using the computer model to simulate the effects of the new conditions or policies. In every instance, the test output will be compared with the base case discussed in section 4.1.

Return to the City

With the increasing costs of gasoline and new homes, many people are starting to look again to the city as a place to live. The inner city has experienced a re-awakening, and the "gentrification" of certain decaying areas (where private rehabilitation is done by new residents who are young and well-to-do) is widespread.[51] Melrose may be ripe for a similar influx of wealthy suburbanites moving closer to Boston who would appreciate living in an area which is comfortable and has direct transportation links to the city.

Figures 20 and 21 show the overall effects of a 20% increase in locational attractiveness to the upper and middle classes starting in 1980. The increased attractiveness does not have the dramatic revitalizing effects that have been seen in poorer areas. With the land area already 95% developed and market values quite high, the new in-migrants find housing difficult to find. New construction, renovation, and demolition (of lower housing) are certainly encouraged, but with vacant lots and abandoned houses few and far between, there is only so far these activities can go. Therefore, there is more crowding of the existing housing stock and market values rise further; both of these factors reduce the city's

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

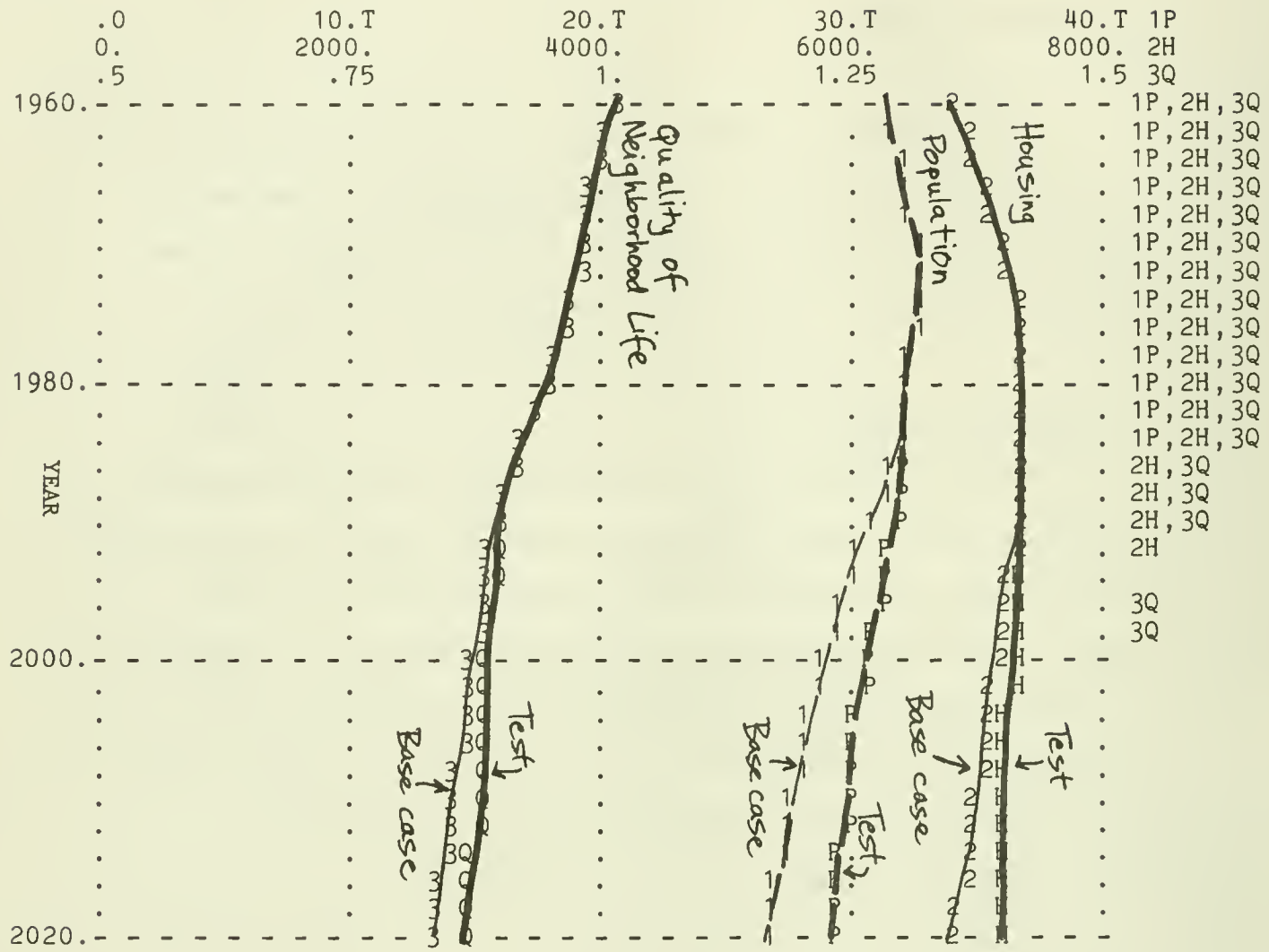


Figure 20: 20% increase in 1980 of locational attractiveness for upper and middle classes—Population, Housing, and Quality of Neighborhood Life

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

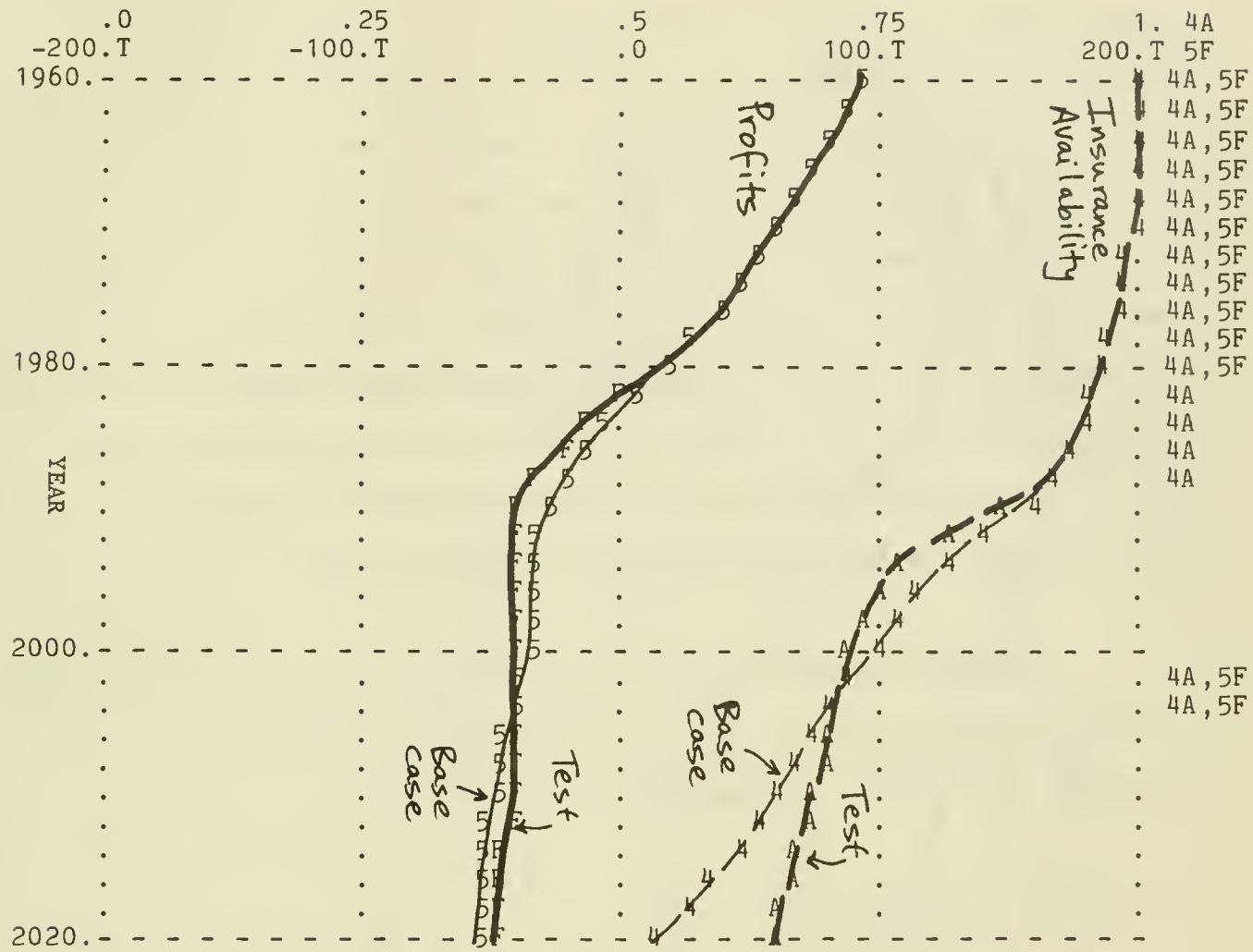


Figure 21: 20% increase in 1980 of locational attractiveness for upper and middle classes--Insurance

drawing power. In addition, the more intensive use of housing reduces company profits relative to the base run until about 2005, because of increased wear and tear. The influx of the upper and middle classes does slow down the transition somewhat; the lower-class population fraction is 24% by the end of the run, compared to the base run's 28%. The resulting increase in quality of neighborhood life relative to the base run is not too significant but does help to stabilize company losses during the last fifteen years of the run. In sum, the "return-to-the-city movement" should not form the basis of Melrose's or the insurance company's hopes for the future, because its beneficial effects are relatively small.

The remaining simulations will consider policies that may be implemented by the insurance company, the city, state, or federal government, or by other involved groups.

Insurance Availability

The only direct policy lever controlled by the insurance company relates to insurance availability. Figures 22 and 23 show the effects of imposing zero availability as of 1980. As expected, the transition is accelerated: population, housing, and the quality of neighborhood life decline more than they did in the base run, and the lower-class fraction increases to 34% by the end of the run (base run: 28%). Although insurance availability is reduced to zero, it takes a few years to non-renew or cancel all outstanding policies. During this time, arson increases substantially and the insurance company's losses are considerable. The quick withdrawal of insurance hurts the company in the short run and pushes the community further along the road to ultimate abandonment. A successful

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

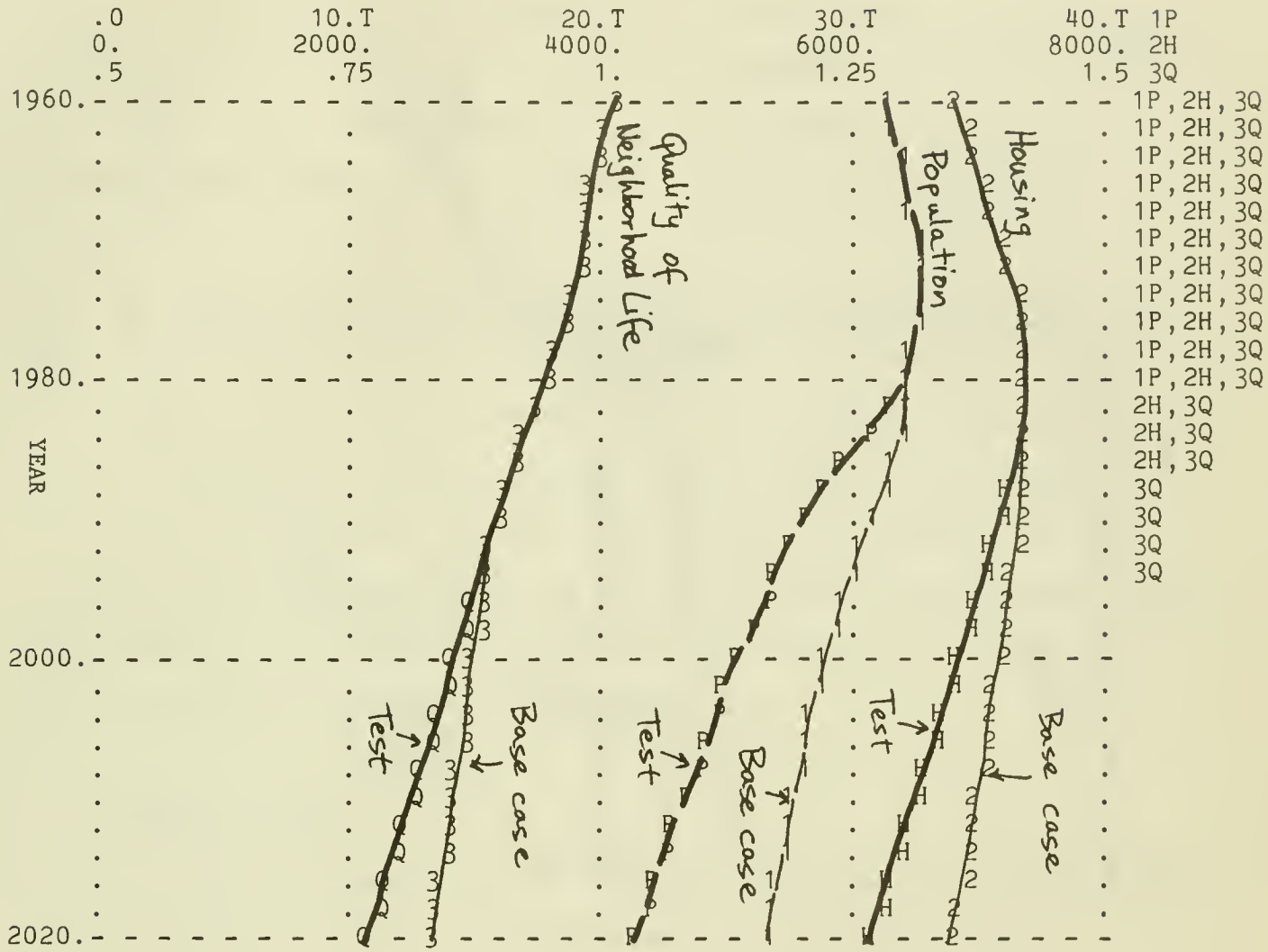


Figure 22: Insurance availability cut to zero in 1980--Population, Housing, and Quality of Neighborhood Life

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

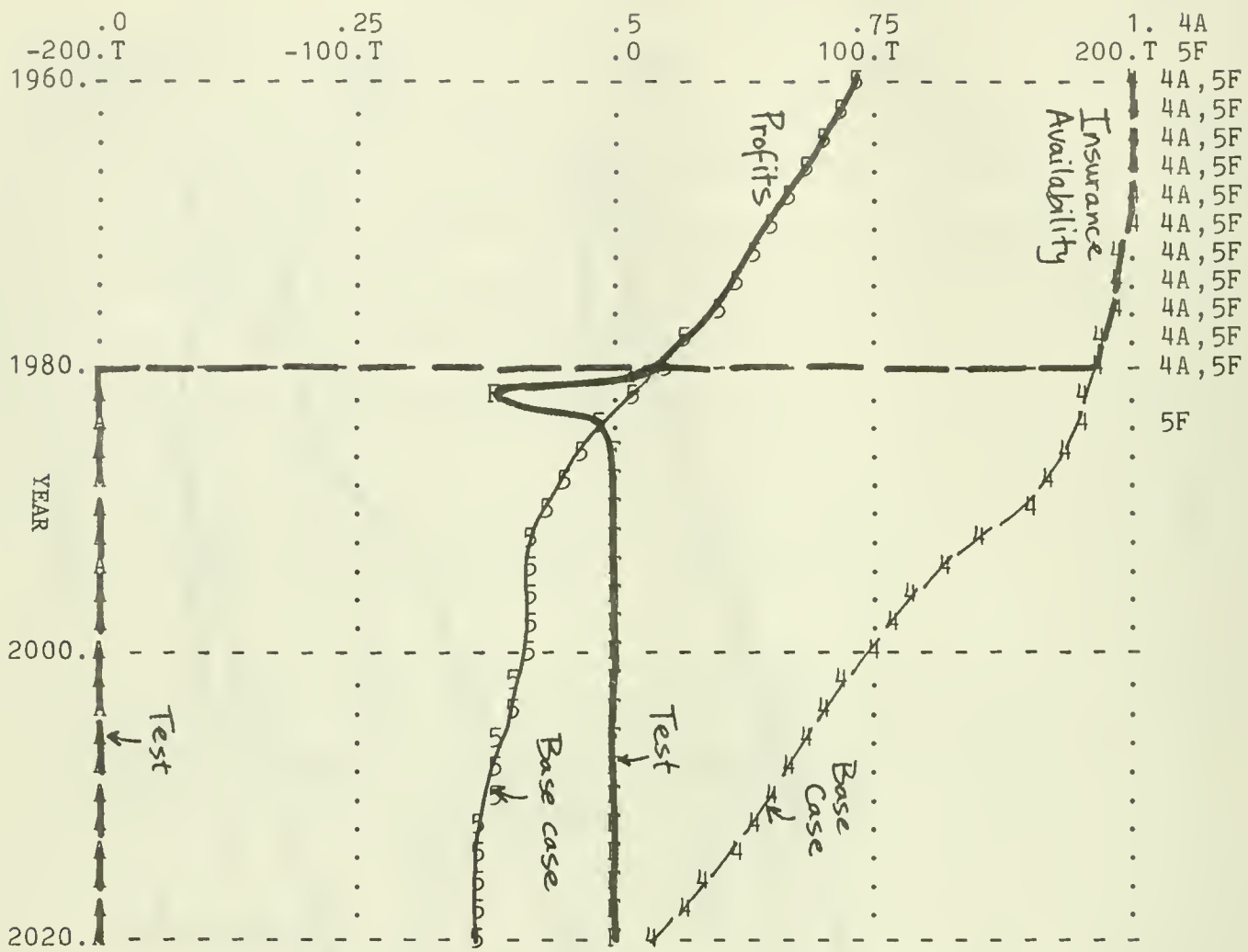


Figure 23: Insurance availability cut to zero in 1980--Insurance

policy, by contrast, would help stabilize the community so that the company can remain and make a reasonable return on its investment.

In order to attract home-buyers who might help in revitalizing the community, the company might decide to make insurance fully available and absorb the short-run losses in the hope of future gains. Figures 24 and 25 show the results of setting insurance availability permanently to 1 in 1980. The impact on population, housing, and quality of neighborhood life is very small; the lower-class fraction is only one percentage point lower than the base run's 28% in 2020. Company losses gradually become greater than they were in the base run. This run demonstrates the inability of the insurance company acting alone to stem the deterioration of the community. The company should look to others whose efforts strike more to the heart of the problem and exert influence to get them involved.

Housing Programs

One idea might be to ask the federal government to continue making funds available for certain housing programs. The prevailing approach among urban planners has been to emphasize housing policies as the way to stimulate community revival.[52] The goal of such policies is generally to "recapture" housing from the lower class by renovating lower housing or demolishing it to make room for new upper and middle housing construction.[53] This approach is similar to zoning against lower housing, except that recapturing actually displaces lower-class residents who had inhabited the dwellings. Displacement of the lower class has been a subject of great concern in the inner cities. One analyst notes: "The displaced residents benefit little from the preservation for others of what

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

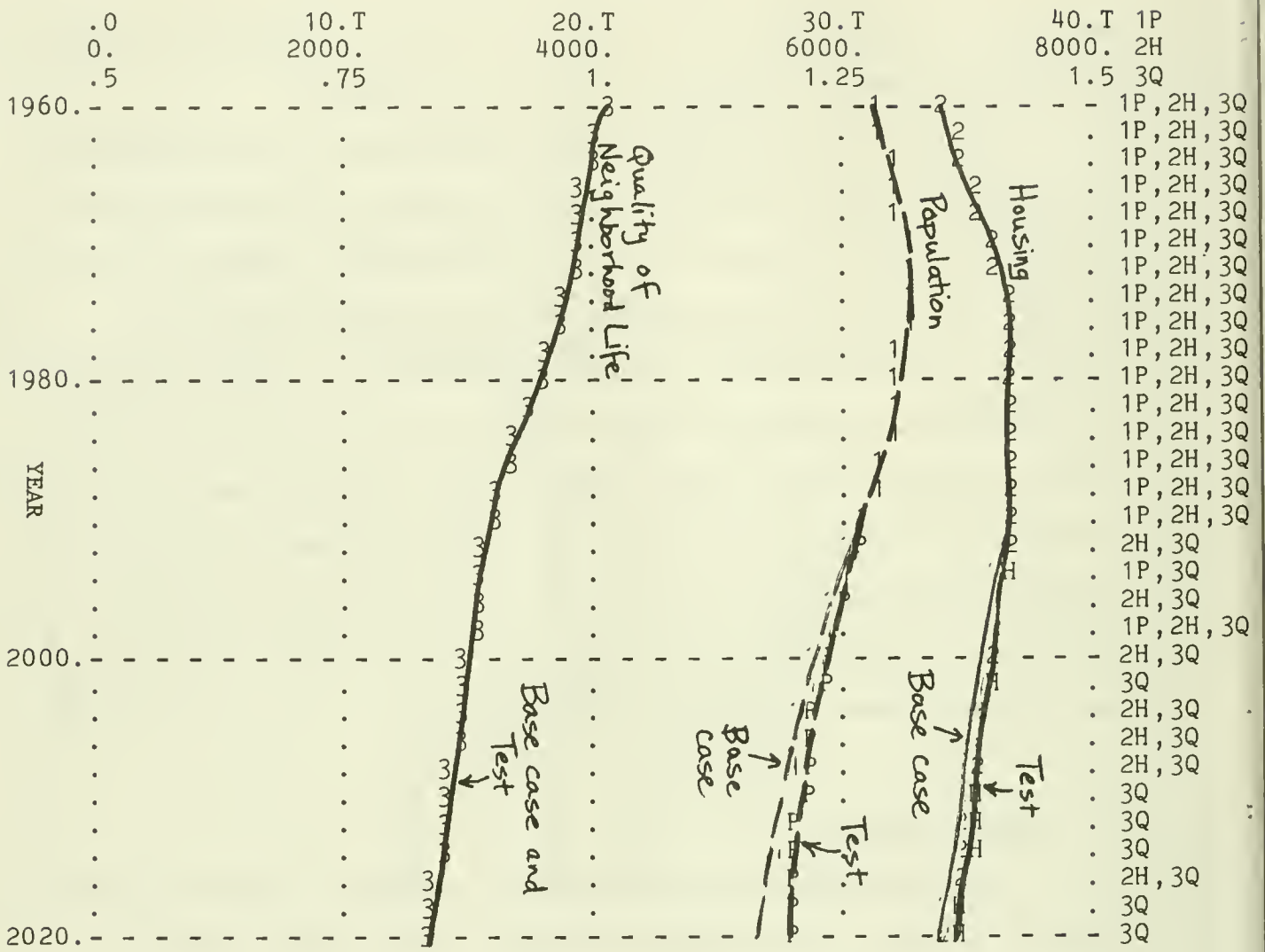


Figure 24: Insurance availability fixed at 1 in 1980--Population, Housing, and Quality of Neighborhood Life

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

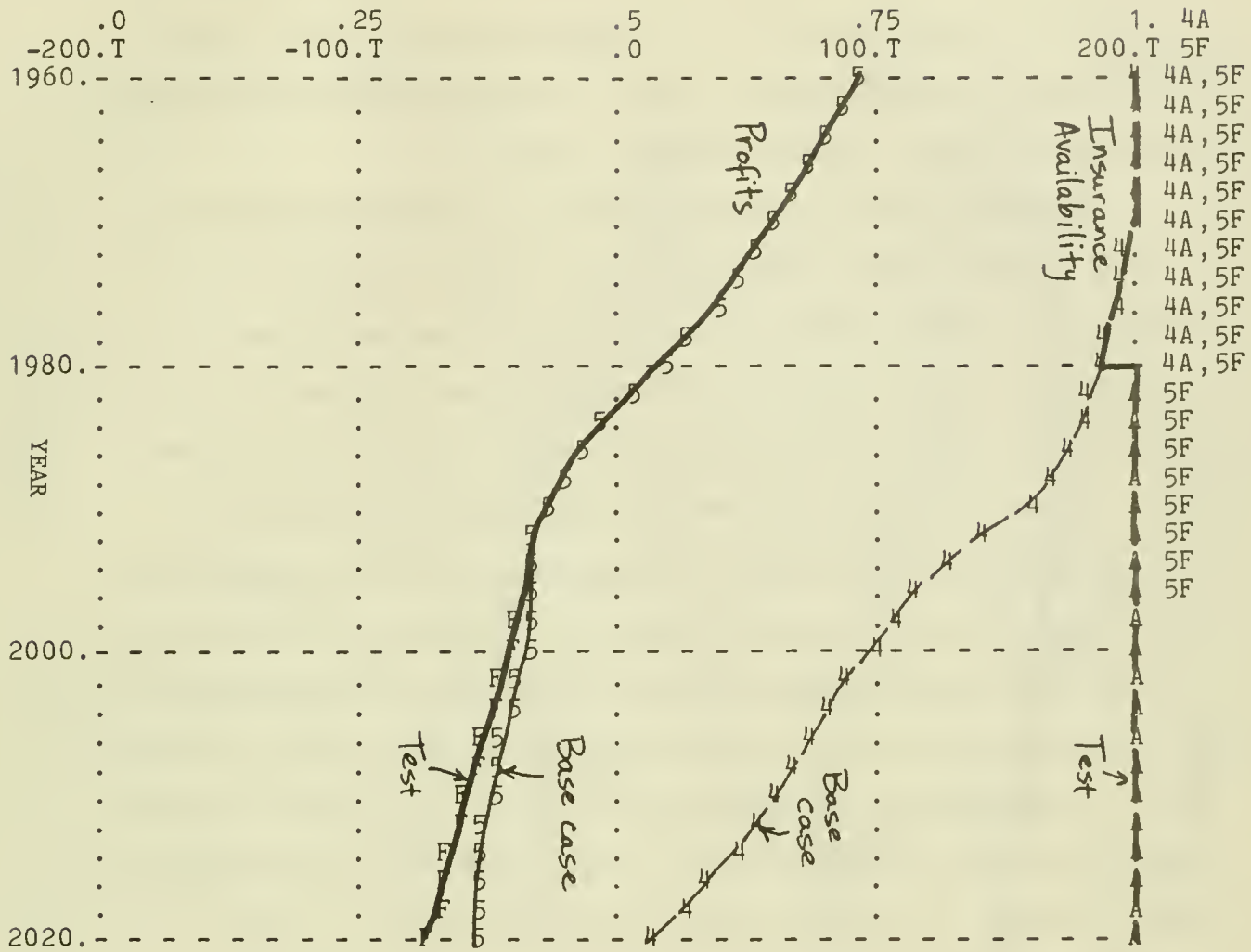


Figure 25: Insurance availability fixed at 1 in 1980—Insurance

was once their neighborhood."[54] The insurance company, however, would applaud any actions that have the effect of increasing profits and thereby obviate the reduction of insurance availability.

Figures 26 and 27 illustrate results of continuing those housing programs in Melrose which speed the removal of lower housing or slow the filter-down of middle housing; these include the lower housing demolition and renovation programs and the middle housing repair program. The lower housing construction and repair programs are phased out, as in the base run. The output indicates that the recapture program is ultimately successful in raising the quality of neighborhood life and company profits, so that the pattern of insurance withdrawal is reversed by the end of this century. While the program does not significantly alter total population and housing, the lower-class fraction is reduced to 20% by 2020 (base run: 28%). The improvements continue beyond 2020, until a condition is reached by the end of the 21st century that is nearly identical to the situation in 1960. In effect, the housing program helps the community to slowly bootstrap itself back to a position of greater stability based on a reduction in the fraction of lower class housing and people.

The most interesting aspect of this policy is how slowly the changes occur. Both profits and the quality of neighborhood life continue to slide downward until the reversal begins in 1990. This indicates that the depressing influences of low neighborhood cohesiveness dominate the scene until a sufficient number of lower class residents have been displaced from the community. Even the most effective housing programs still do not get to the bottom of the problem of sustained community deterioration, which is more social and political than physical or economic in nature.

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

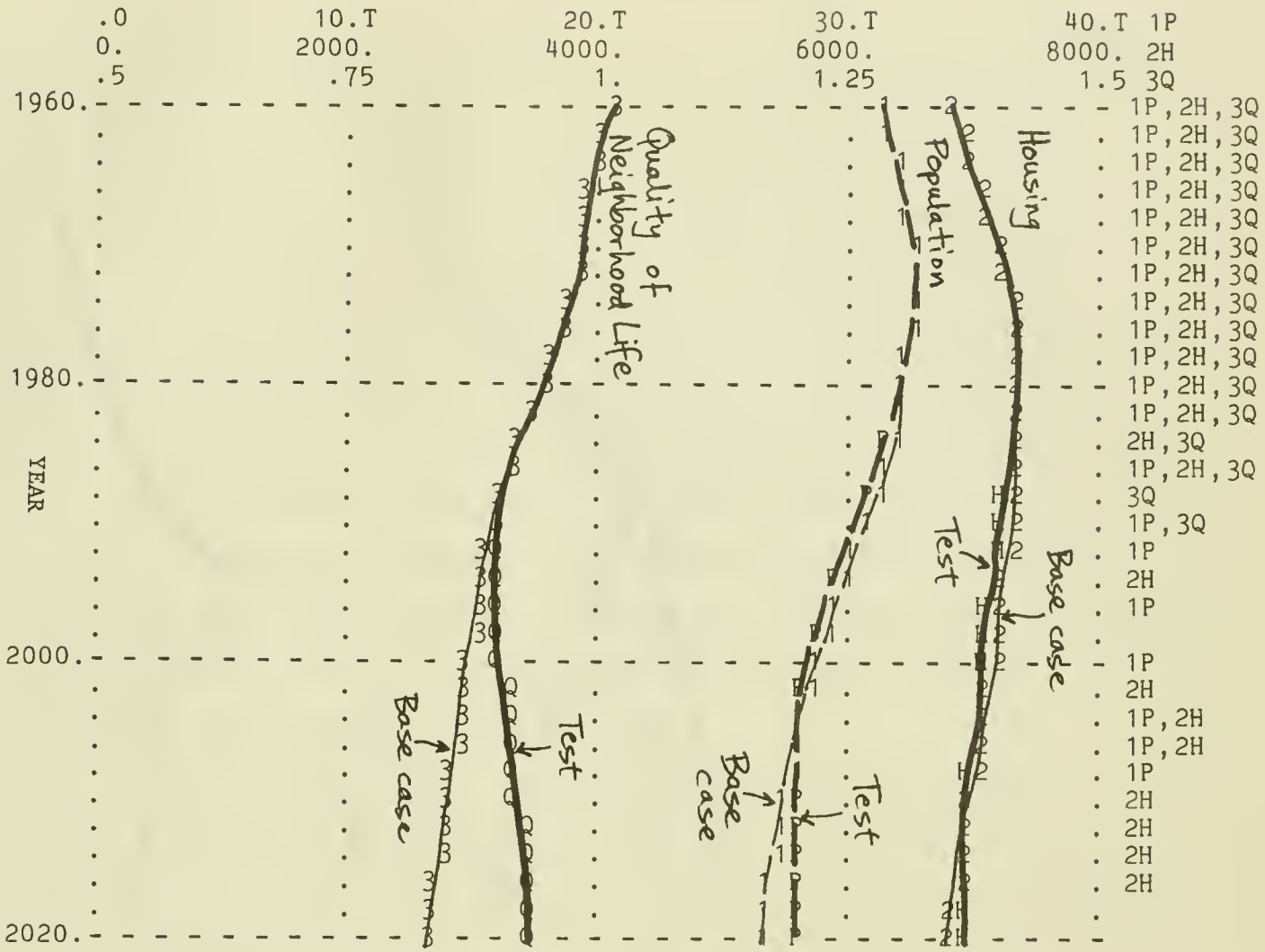


Figure 26: Housing Recapture: No phase-out of lower housing demolition and renovation and middle housing repair programs—Population, Housing, and Quality of Neighborhood Life

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

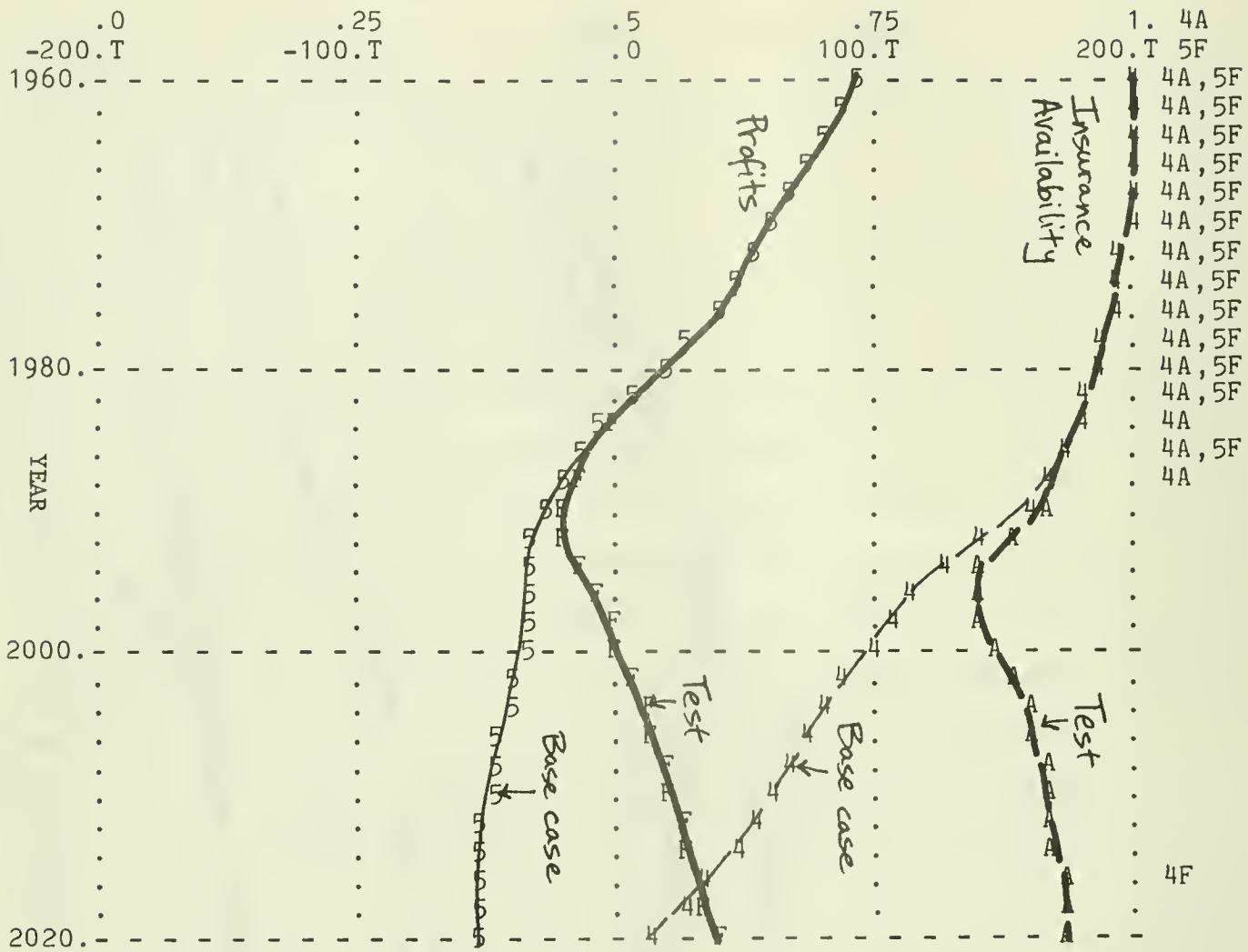


Figure 27: Housing Recapture: No phase-out of lower housing demolition and renovation and middle housing repair programs--Insurance

Neighborhood Services Programs

The capital improvement and historic preservation programs in Melrose were not included in the base run, under the pessimistic assumption that their effects would not be significant. However, it is possible that the "Victorian Melrose" campaign will lead to increased visibility and subsequent upgrading of the central business district and make more high quality public facilities and services available to the city's residents. The rehabilitation of a few parks and playgrounds and the construction of a public parking facility should also increase neighborhood services somewhat. Past research indicates that neighborhood services programs, including physical and environmental improvements to the city's public areas, are seen as very desirable by many residents and can increase confidence and the overall quality of life.[55]

Figures 28 and 29 show the results of a neighborhood services program initiated in 1980 which raises the index of neighborhood services per capita by .1 (which is 10% of its 1980 value of 1). The overall effect is clearly beneficial, and all of the plotted variables remain higher than in the base run. Interestingly, the benefits are reaped without much change in community composition relative to the base run: the lower-class fraction in 2020 is only two percentage points lower than the base run's 28%. However, the services program does not provide a firm basis for increased community cohesiveness, since it does not deal directly with social and political relationships. As a result, the quality of neighborhood life and company profits decline steadily after the mid-1980s and are lower than their 1980 values by the end of the run. In sum, neighborhood services programs can be an effective way to increase pride in the larger

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

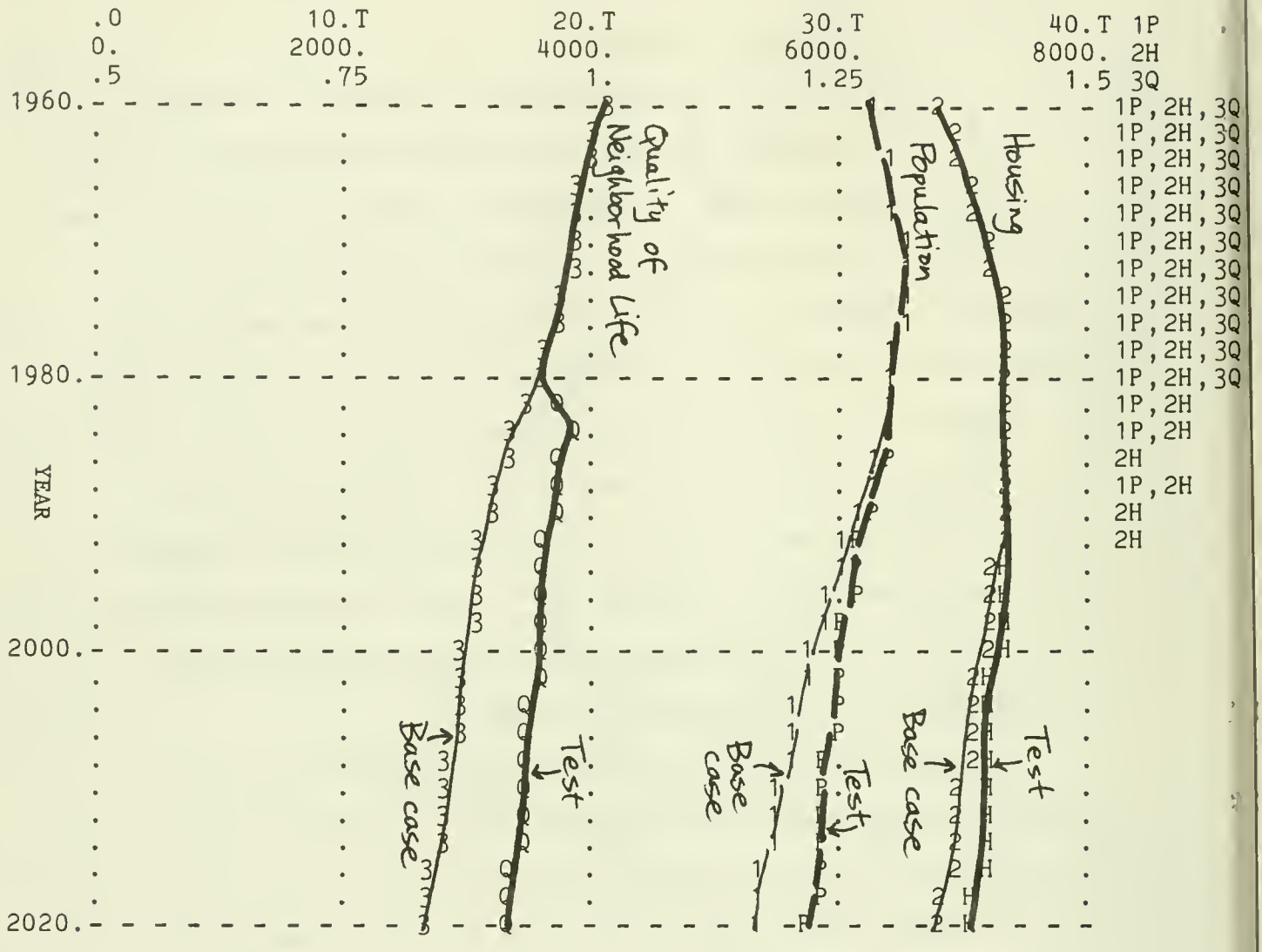


Figure 28: Neighborhood Services Program (NSP=.1) initiated in 1980--Population, Housing, and Quality of Neighborhood Life

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

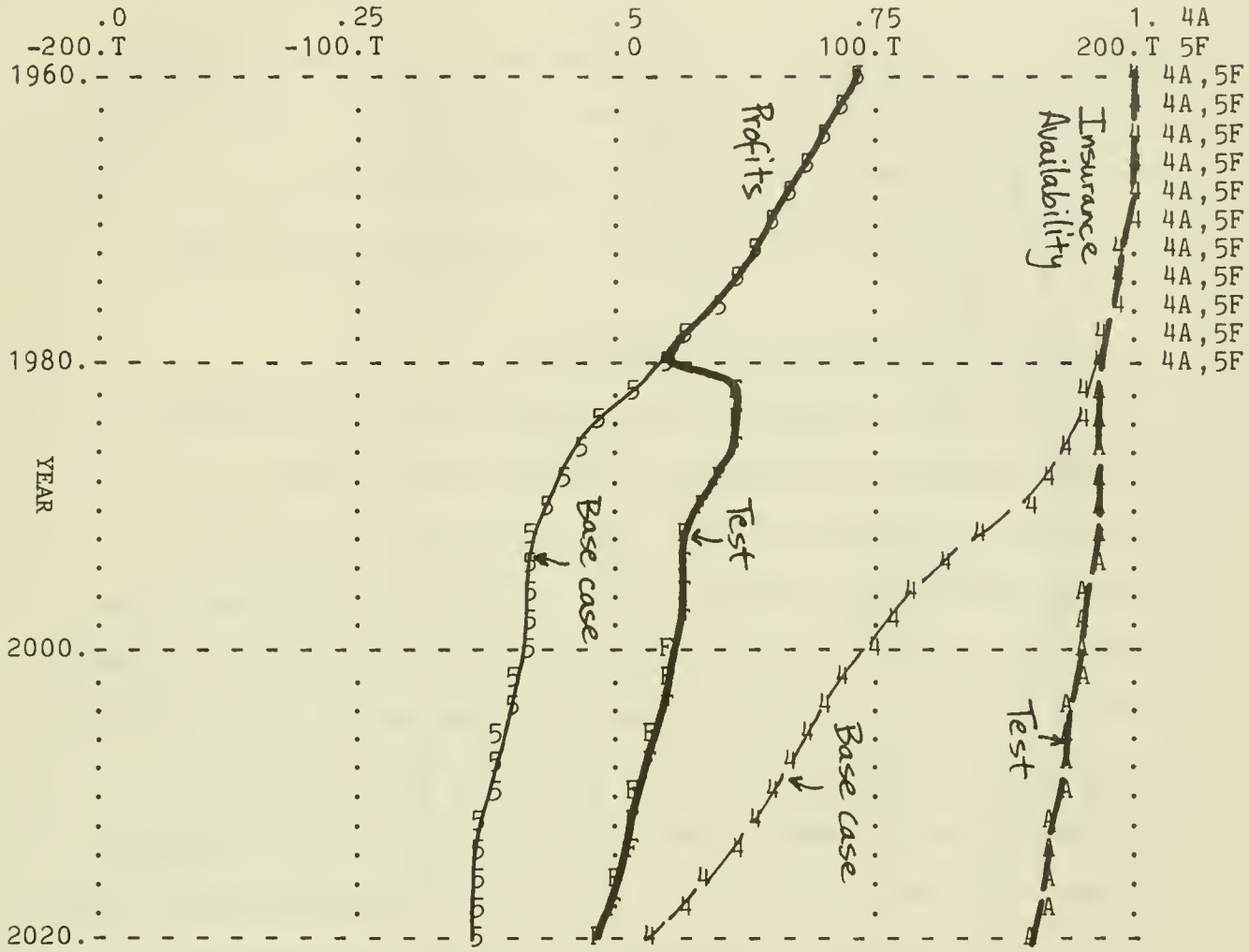


Figure 29: Neighborhood Services Program (NSP=.1) initiated in 1980—Insurance

community, but they do not have much leverage in improving neighborhood cohesiveness, which is vital to the community's long-term health. The insurance company should therefore encourage such programs, but not to the exclusion of even more direct approaches to community stabilization.

Promotion of Neighborhood Organizations

The final simulation considers an approach to the problems of transition which has been advocated by some analysts: namely, the involvement of government or other interested parties in promoting effective neighborhood organizations, by means which include "publishing informational booklets about community organizations, providing increased technical assistance, funding for community organizers, or the actual provision of the organizers".[56] Such efforts serve to promote the participation and influence of the citizens in preserving the community. Furthermore, "[T]here is a greater likelihood of current rather than future neighborhood residents benefiting when residents control programs".[57]

The results of a program which boosts organizational capability by 20% starting in 1980 are shown in Figures 30 and 31. (In the model, the "effect of leadership on neighborhood organization" is increased from its normal value of 1 to 1.2.) A comparison with the neighborhood services program (see Figures 28 and 29) indicates that the two programs have very similar effects in the first few years after their initial implementation. However, the present policy does much more to stabilize the community and keep the quality of neighborhood life and company profits reasonably high throughout the run. This is primarily because of the feedback between neighborhood organization and cohesiveness (which was alluded to in section

FILE INSUR2D NEIGHBORHOOD INSURANCE MODEL 12/10/79 19:37 LEAD

POP.BASE=1,POP=P,HSG.BASE=2,HSG=H,QNL.BASE=3,QNL=Q

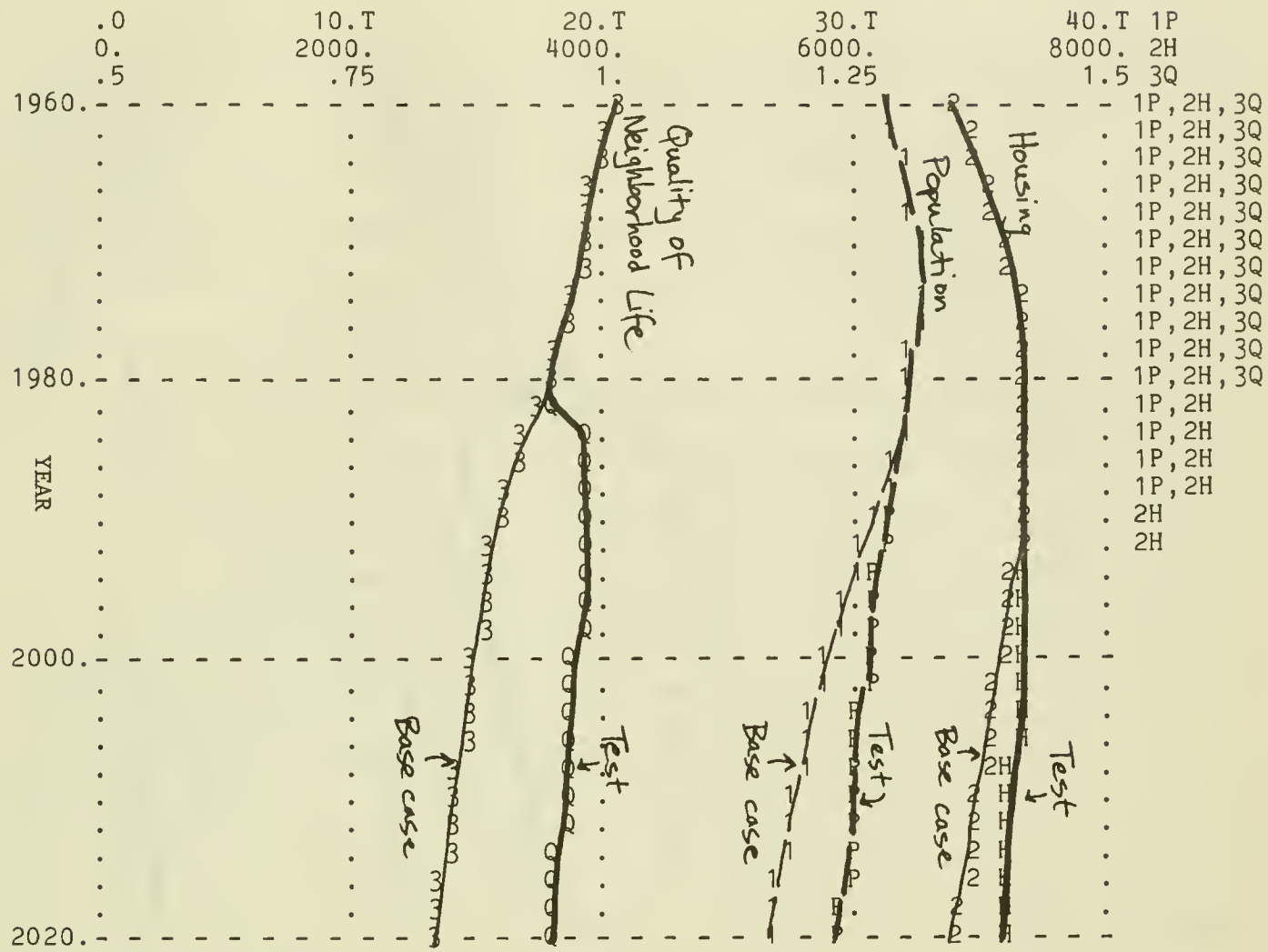


Figure 30: 20% increase in organizational capability in 1980--Population, Housing, and Quality of Neighborhood Life

D-3180 FILE INSUR2D NEIGHBORHOOD INSURANCE MODEL 12/10/79 19:37 LEAD

IA.BASE=4,IA=A,PROF.BASE=5,PROF=F

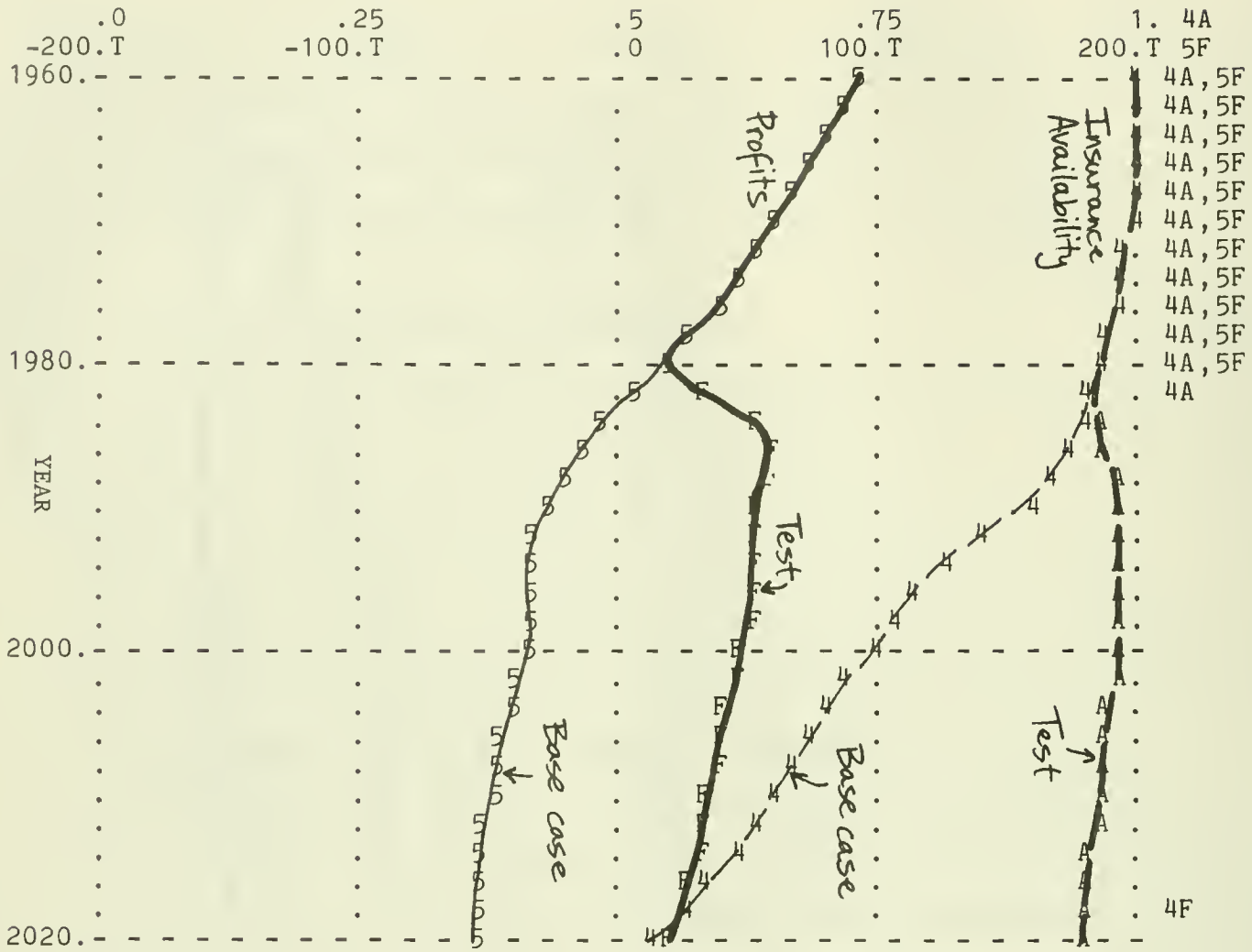


Figure 31: 20% increase in organizational capability in 1980--Insurance

2.4 and can be seen in Figure 5). To reiterate this point, more capable organizations draw forth greater citizen participation, which will enhance the sense of community and the effectiveness of the neighborhood organizations. The computer output indicates that there is still some lingering decline, because community participation cannot altogether eliminate existing class tensions.

The neighborhood organization assistance program acts, like the neighborhood services program and unlike the housing recapture program, to stabilize the neighborhood for the new mix of people rather than for the old mix: the lower-class fraction is only three percentage points lower than the base run's 28% by 2020. Furthermore, it may be the best method available to city government to strengthen the social fabric of the community and thus increase commitment as well as insurance company profitability.

6. CONCLUSIONS

Change in Melrose has been studied with an eye toward suggesting how insurance companies should regard and respond to transition in the inner suburbs. The transition itself is not cause for alarm, because it is a necessary consequence of decreasing land availability and may proceed for several decades without leading to further deterioration thereafter. What should be investigated in the case of a specific community is how the transition affects neighborhood cohesiveness, which, when low, reflects racial, ethnic, or class-based animosity and defensiveness. A smooth transition to equilibrium will occur when the social fabric is not significantly damaged by decreasing cohesiveness. Otherwise, the potential for continued deterioration and abandonment exists and the insurance company should stand warned.

The policy analysis of the previous section suggests that the insurance company cannot reverse the self-sustaining transition by simply making insurance more available. If there is hope for stabilization, it must be achieved by a partnership of the city and its institutional environment, which includes the government (as the biggest, richest, and most influential participant) as well as community consulting organizations, local business establishments, and sources of funds like banks, savings and loans, and insurance companies. Furthermore, this stabilization must be based on a comprehensive approach which does more than upgrade housing. Community services and facilities are important, not only because of the direct benefit derived by their users, but also because of the image of vibrancy and unity they can present to potential investors. The latter

effect alone explains the successful revitalization of "theme towns" like Salem and Newburyport, Massachusetts. But, in general, a community with a fast-declining quality of life needs more than a slick new image to turn itself around socially, physically, and economically. As Ahlbrandt and Cunningham state: "A neighborhood preservation program...must also be directed toward strengthening the sense of community and the socializing or neighboring activities of the residents, including harmony and joint efforts among people of different races and nationalities."[58] This study has indicated how social relationships can affect all aspects of the community.

Although cohesiveness is an abstract concept, it has a very real meaning for communities undergoing transition. In each community, the exact causes of mistrust and factionalization and the actions that can remedy these problems will be unique. The development of effective community organizations depends on a combination of public and private interests working at the problems from within, giving the neighborhood people a large hand in the political process. The solutions will often come from those folks who experience daily the shocks and bad feelings associated with neighborhood transition.

Insurance companies have a stake in seeing that their investments in communities are protected and should therefore learn to recognize where there might be trouble ahead and how to respond to this situation. Since insurers are not generally in a good position to take the kinds of actions that are needed to bring stability to a dangerously declining community, they must depend instead upon the power of persuasion to get the right things done. By calling for preventive actions that address the root causes of deterioration, they can help insure the community in a broader sense of the term.

NOTES

1. Hughes, 74-77, and Birch, 80-82, in Hughes (ed.); Cohen, 340-341.
2. Mass. Dept. of Community Affairs, Office of Legal Assistance, 3.
3. Bureau of National Affairs, Law Week, 48LW2023.
4. Birch (unpublished paper), 6, 9.
5. Forrester, 15,117.
6. City of Tampa, Bureau of City Planning, 7.
7. Alfeld and Graham, 10, 11; Goodman, 5-10.
8. Suttles, 188.
9. Alfeld and Graham, 38; Forrester, 34,173,189.
10. Keller, 51.
11. Keller, 111.
12. Bud Roy, Commercial Union Assurance Companies, personal communication.
13. U.S. Subcommittee on Citizens' and Shareholders' Rights'. 402.
14. Michael Cushinsky, Commercial Union, personal communication.
15. City of Melrose, Annual Reports.
16. Hollister, et al., 166-169; Ahlbrandt and Cunningham, 21-23.
17. Hollister, 36;
    Goering, 76;
    Mumford, 195;
    Keller, 115.
18. Marans and Rogers, 110.
19. Marans and Rogers, 32.
20. Keller, 103.
21. Ahlbrandt and Cunningham, 35; Cohen, 355.
22. Keller, 152.

23. Keller, 52, 54; Marans and Rogers, 95; Mumford, 198.

24. Keller, 111; Marans and Rogers, 86.

25. Suttles, 160.

26. Keller, 82.

27. Ahlbrandt and Cunningham, 34.

28. Ahlbrandt and Cunningham, 27.

29. Marans and Rogers, 79.

30. Mumford, 195.

31. Suttles, 27.

32. Goering, 75; Ahlbrandt and Cunningham, 6-8, 13;
Hollister, 7, 11, 94, 140.

33. Michael Cushinsky and Bud Roy, Commercial Union, personal communication.

34. Bud Roy, Commercial Union, personal communication.

35. Goss;
Gerald Mimno, Melrose, personal communication.

36. Osgood, 4.

37. Gerald Mimno, Melrose, personal communication.

38. Mass. Dept. of Comm. Affairs, Office of Legal Assistance, 28.

39. City of Melrose, Melrose Downtown Turnaround, 2.

40. City of Melrose, Community Development Plan (1978).

41. Gerald Mimno, Melrose, personal communication.

42. Osgood, 35.

43. U.S. Bureau of Census (1970);
City of Melrose, Community Development Plan (1978).

44. Bud Roy, Commercial Union, personal communication.

45. Michael Cushinsky, Commercial Union, personal communication. Although no direct evidence of actual profits in Melrose could be obtained, profits in similar transitional communities have in fact declined, in some cases below the break-even point.

46. Hughes, 74-76, and Birch, 81-82, in Hughes (ed.); Cohen, 340-341.

47. Forrester, Urban Dynamics. Forrester's model was not restricted to primarily residential communities (and, in fact, was designed to represent the entirety of a large city) and so included a business sector not relevant for this study.

48. Forrester, Chapter 3, Appendix A; Alfeld and Graham, 38, 239, 240; Goodman, "Exercise 12: Residential Community Model"; Mass, "Structural Changes in Urban Dynamics: Housing Obsolescence and Housing Demand."

Forrester adds to this theory the effects of population mix and the tax rate on migration. With respect to population mix: INSUR2 includes the assumption that the upper and middle classes tend to stay away from communities that are perceived to be too lower-class (and the upper class are even somewhat finicky about a middle-class community). With respect to the tax rate: As the underemployed (lower-class) fraction increases in the Urban Dynamics model, the tax burden on the city increases, which tends to repel the upper and middle classes. This effect seems sufficiently similar to that of population mix that it has not been explicitly modeled in INSUR2.

49. Ahlbrandt and Cunningham, 23; Hollister, 173.

50. Mass. Dept. of Comm. Affairs, Office of Legal Assistance, 53.

51. Clay, 3.

52. Cohen, 346.

53. Hollister, 25.

54. Cohen, 347.

55. Ahlbrandt and Cunningham, 30; Hollister, 141.

56. Ahlbrandt and Cunningham, 27.

57. Cohen, 347.

58. Ahlbrandt and Cunningham, 30.

REFERENCES

Ahlbrandt, Roger S., and Cunningham, James V. Analysis of the Commitment of Citizens to Pittsburgh's Neighborhoods and Policy Recommendations for City Government. Mimeographed "Summary and Conclusions." School of Social Work, University of Pittsburgh, 1975.

Birch, David L. "The Community Analysis Model: A Behavioral Model of Neighborhood Change." M.I.T. Program on Neighborhood and Regional Change, M.I.T., 1977 (Mimeographed).

"Chicago Bank Makes Money on Loans that Aid Deteriorating Neighborhood," New York Times. July 30, 1979.

City of Melrose, Massachusetts.
Master Plan (1947, 1962).
Annual Reports (1967,1968,1976,1977,1978).
Melrose Downtown Turnaround. Melrose Planning Board: 1976.
Community Development Plan for Melrose: Small Cities Comprehensive Grant Application; Fiscal Years 1978, 1979, 1980 (1978).

City of Tampa, Bureau of City Planning. Redlining. Florida, 1978.

Clay, Philip. "Neighborhood Revitalization and Community Development: The Experience and the Promise," Center for Community Development Newsletter. August-October, 1978.

Cohen, Rick. "Neighborhood Planning and Political Capacity," Urban Affairs Quarterly, Vol. 14, No. 3. March, 1979.

Forrester, Jay W. Urban Dynamics. M.I.T. Press, Cambridge, Mass., 1969.

Goering, John M. "Neighborhood Tipping and Racial Transition: A Review of Social Science Evidence," AIP Journal, Vol. 44, No. 1, January, 1978.

Goetze, Rolf, and Colton, Kent W. "The Dynamics of Cities: A Fresh Approach to Understanding Housing and Neighborhood Change." Boston, 1978 (mimeographed).

Goodman, Michael R., ed. Study Notes in System Dynamics. Wright-Allen Press, Cambridge, Mass., 1974.

Goss, Elbridge Henry. The History of Melrose. City of Melrose, 1902.

Hollister, Robert M., with Deborah Auger, Adrian Ruth Waler, and Timothy Pattison. Measuring Neighborhood Confidence. As part of Neighborhood Confidence Project, under grant from U.S. Dept. of Housing and Urban Development. Boston, 1978.

Homer, Jack, B. "INSUR1: A Dynamic Model of Property Insurance Coverage in an Urban Neighborhood." System Dynamics Group Memo D-3120, M.I.T., 1979.

Hughes, James W., ed. Suburbanization Dynamics and the Future of the City. Center for Urban Policy Research, Rutgers University, New Jersey, 1974.

"Insurance Redlining is Fair Housing Act Violation," Law Week's Summary and Analysis of Current Law. Bureau of National Affairs, Inc., July 10, 1979.

Keller, Suzanne. The Urban Neighborhood: A Sociological Perspective. Random House, Inc., New York, 1968.

Marans, Robert W. and Rogers, Willard. Toward an Understanding of Community Satisfaction. Institute for Social Research, The University of Michigan, 1972.

Mass, Nathaniel J., ed. Readings in Urban Dynamics, Vol. 1. Wright-Allen Press, Cambridge, Mass., 1974.

Massachusetts Department of Community Affairs, Office of Legal Assistance. Monitoring Change in Residential Neighborhoods; Case Study: Melrose, Massachusetts (Local Assistance Series Publication Number 6). City of Boston, 1975.

Minot, DeBlois, and Maddison, Inc. (for Melrose Planning Board). Market Trends and Development Potentials: Downtown Area, Melrose, Massachusetts. May, 1975.

Mumford, Lewis. The Urban Prospect. Harcourt, Brace, and World, Inc., New York, 1956.

Osgood, Eva S. (Chairman, Melrose Planning Board). The Collaborative Plan: Melrose, Massachusetts, 1930.

Suttles, Gerald D. The Social Construction of Communities. The University of Chicago Press, Chicago, 1972.

"Timilty Panel to Urge 'Redlining' Ban," Boston Globe, March 13, 1979.

U.S. Bureau of Census; U.S. Government Printing Office, Washington, DC.

1970 Census of Population. Vol. 1: Characteristics of the Population: Massachusetts (1973).

1970 Census of Population and Housing. Census Tracts: Boston, Mass. SMSA (1972).

1970 Census of Housing. Housing Characteristics for States, Cities, and Counties: Massachusetts (1972).

1972 Census of Retail Trade. Vol. 2: Area Statistics, Iowa-North Carolina (1976).

1972 Census of Manufactures. Vol. 3: Area Statistics, Alabama-Montana (1976).

1960 Census of Population. Detailed Characteristics: Massachusetts (1962).

1960 Census of Population and Housing. Census Tracts: Boston, Massachusetts SMSA (1962).

1950 Census of Population. Selected Population and Housing Characteristics: Massachusetts (1952).

1950 Census of Population. Vol. 3: Census Tracts: Boston and Adjacent Area (1952).

United States Senate. Committee on the Judiciary. Rights and Remedies of Insurance Policyholders. Hearings before the Subcommittee on Citizens and Shareholders Rights and Remedies, January, 1978.

BAR CODE ON
NEXT TO LAST PAGE